NASA

Aerospace Medicine and Biology
A Continuing Bibliography with Indexes

NASA SP-7011 (196)
August 1979

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National Aeronautics and Space Administration

Aerospace Medicine & Biology

Aerospace Medicine and Biology
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August 1979

ACCESSION NUMBER RANGES

Accession numbers cited in this Supplement fall within the following ranges.

STAR (N-10000 Series)	N79-21994 – N79-23887
IAA (A-10000 Series)	A79-32247 – A79-35926

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NASA SP-7011 (196)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 196)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in July 1979 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

NASA Scientific and Technical Information Branch 1979
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Washington, DC

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* (NASA SP-7011) lists 126 reports, articles and other documents announced during July 1979 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964; since that time, monthly supplements have been issued.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged in two major sections: *IAA Entries* and *STAR Entries*, in that order. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the slight variation in citation appearances.

Two indexes -- subject and personal author -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1979 Supplements.

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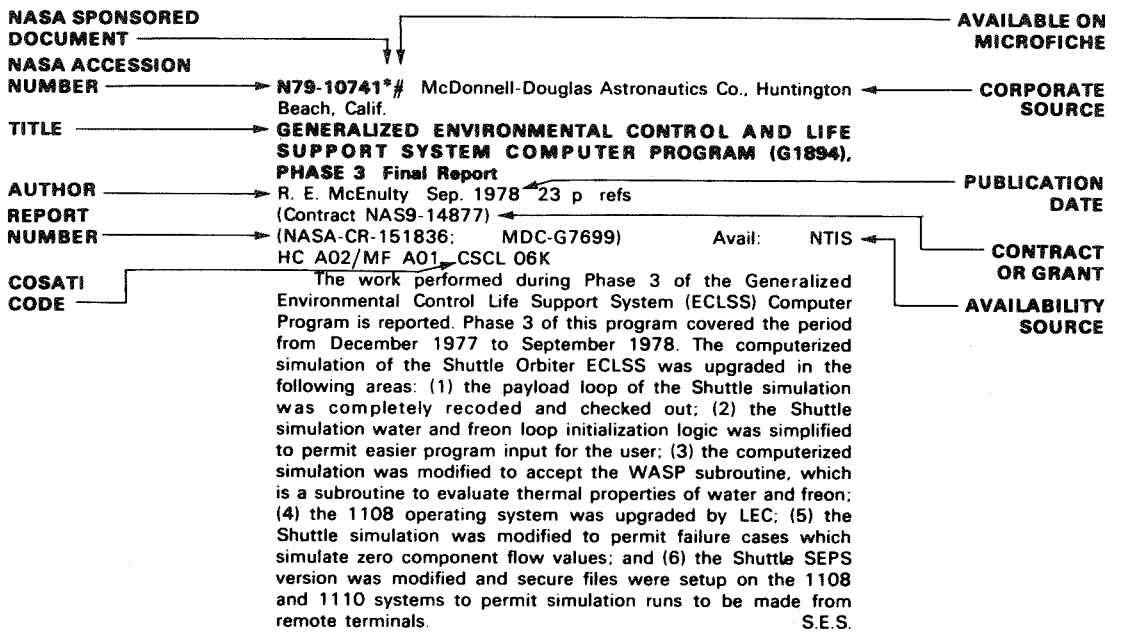
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TITLE
GENERALIZED ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM COMPUTER PROGRAM (G1894), PHASE 3 Final Report
AUTHOR
R. E. McEnulty Sep. 1978 23 p refs
PUBLICATION DATE
REPORT NUMBER
(Contract NAS9-14877)
(NASA-CR-151836; MDC-G7699) Avail: NTIS HC A02/MF A01 CSCL 06K
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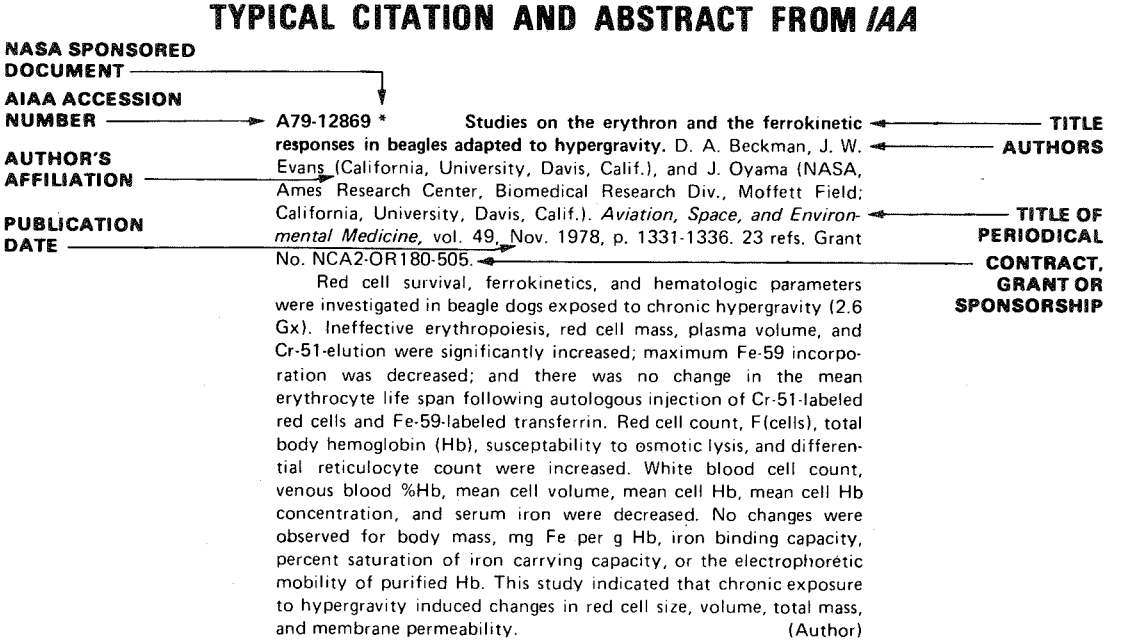
The work performed during Phase 3 of the Generalized Environmental Control Life Support System (ECLSS) Computer Program is reported. Phase 3 of this program covered the period from December 1977 to September 1978. The computerized simulation of the Shuttle Orbiter ECLSS was upgraded in the following areas: (1) the payload loop of the Shuttle simulation was completely recoded and checked out; (2) the Shuttle simulation water and freon loop initialization logic was simplified to permit easier program input for the user; (3) the computerized simulation was modified to accept the WASP subroutine, which is a subroutine to evaluate thermal properties of water and freon; (4) the 1108 operating system was upgraded by LEC; (5) the Shuttle simulation was modified to permit failure cases which simulate zero component flow values; and (6) the Shuttle SEPS version was modified and secure files were setup on the 1108 and 1110 systems to permit simulation runs to be made from remote terminals.
S.E.S.

TYPICAL CITATION AND ABSTRACT FROM *IAA*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AIAA ACCESSION NUMBER
A79-12869 * Studies on the erythron and the ferrokinetic responses in beagles adapted to hypergravity.
TITLE
D. A. Beckman, J. W. Evans
AUTHORS
AUTHOR'S AFFILIATION
(California, University, Davis, Calif.), and J. Oyama (NASA, Ames Research Center, Biomedical Research Div., Moffett Field; California, University, Davis, Calif.).
PUBLICATION DATE
Aviation, Space, and Environmental Medicine, vol. 49, Nov. 1978, p. 1331-1336. 23 refs. Grant No. NCA2-OR180-505.
TITLE OF PERIODICAL
CONTRACT, GRANT OR SPONSORSHIP
Red cell survival, ferrokinetics, and hematologic parameters were investigated in beagle dogs exposed to chronic hypergravity (2.6 Gx). Ineffective erythropoiesis, red cell mass, plasma volume, and Cr-51-elution were significantly increased; maximum Fe-59 incorporation was decreased; and there was no change in the mean erythrocyte life span following autologous injection of Cr-51-labeled red cells and Fe-59-labeled transferrin. Red cell count, F(cells), total body hemoglobin (Hb), susceptability to osmotic lysis, and differential reticulocyte count were increased. White blood cell count, venous blood %Hb, mean cell volume, mean cell Hb, mean cell Hb concentration, and serum iron were decreased. No changes were observed for body mass, mg Fe per g Hb, iron binding capacity, percent saturation of iron carrying capacity, or the electrophoretic mobility of purified Hb. This study indicated that chronic exposure to hypergravity induced changes in red cell size, volume, total mass, and membrane permeability.
(Author)

AEROSPACE MEDICINE AND BIOLOGY

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AUGUST 1979

IAA ENTRIES

A79-32319 Photochemical transformations of the visual pigment rhodopsin. M. A. Ostrovskii and I. B. Fedorovich (Akademiia Nauk SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR). *(Kvantovaia Elektronika* /Moscow/, vol. 5, Oct. 1978, p. 2263-2270.) *Soviet Journal of Quantum Electronics,* vol. 8, Oct. 1978, p. 1274-1278. 28 refs. Translation.

The primary vision processes that occur in specialized light-sensitive visual cells of the retina are described. Photolysis of rhodopsin is discussed, along with the production of hypsorhodopsin, the conversion of rhodopsin into bathorhodopsin, the rate of bathorhodopsin formation at low temperatures, and the production of metarhodopsin I, II, and III in subsequent stages of photolysis. Results are summarized for investigations of the kinetics of the formation and dissociation of bathorhodopsin under various illumination conditions and for various rhodopsin specimens. A possible time sequence of the photolysis reactions is outlined, reverse trans-cis isomerization of retinal is considered, and results of photoregeneration experiments are briefly reviewed. F.G.M.

A79-32320 The development of laser exposure limits. D. H. Sliney (U.S. Army, Environmental Hygiene Agency, Aberdeen Proving Ground, Md.). *(Kvantovaia Elektronika* /Moscow/, vol. 5, Oct. 1978, p. 2271-2281.) *Soviet Journal of Quantum Electronics,* vol. 8, Oct. 1978, p. 1278-1284. 17 refs.

The paper deals with different mechanisms of retinal injury caused by lasers under various viewing conditions: collimated spot image, extended source, diffusely reflecting source, etc. Tables are given of the laser exposure limits established in the U.S.A. for intrabeam (direct) and diffusely reflected laser light, which may be hazardous to the human eye or skin. (Author)

A79-32626 Short-term memory factors in ground controller/pilot communication. G. R. Loftus (Washington, University, Seattle, Wash.), D. Williams (California, University, San Diego, Calif.), and V. J. Dark. *Human Factors,* vol. 21, Apr. 1979, p. 169-181. 12 refs. NSF Grant No. BMS-75-10450.

Communication between ground controllers and pilots was simulated in a short-term memory task in order to explore sources of memory errors in the air traffic control system. As expected from prior short-term memory research, two major determinants of error probability were (1) amount of information that the pilot has to process in a given time and (2) retention interval between the time information is transmitted from the controller and the time it is acted on (recalled) by the pilot. Additionally, the manner of encoding numerical information was varied. The result of this manipulation indicated that, as suggested by recent research in cognitive psychology, the current information-encoding scheme has substantial room for improvement in terms of minimizing memory failure. (Author)

A79-32627 Predictive validity of flight simulators as a function of simulator motion. J. M. Koonce (Illinois, University, Urbana, Ill.). *Human Factors,* vol. 21, Apr. 1979, p. 215-223. 16 refs. Contract No. F44620-70-C-0105.

Ninety multi-engine instrument rated pilots were assigned to no motion, sustained linear scaled down analog motion, and washout motion in a GAT II simulator for determining the effects of degree of motion upon the predictive validity of flight simulators. Five instrument and five contact maneuvers were flown in the simulator followed by flight in a Piper Aztec aircraft. Performances were recorded by two observers and the interobserver reliability coefficients were 0.962 and 0.919 for instrument maneuvers and 0.879 and 0.613 for contact maneuvers in the simulator and aircraft, respectively. The condition of no motion resulted in greater error than the other two groups in the simulator, but there were no significant differences in the aircraft. Correlations of aircraft performance from the simulator maneuvers were 0.763 (no motion), 0.911 (sustained motion), and 0.651 (washout motion). Simulator motion did not result in better aircraft performance, and higher predictive validity was found with very basic sustained motion. (Author)

A79-32628 Visual contrast sensitivity functions obtained with colored and achromatic gratings. M. A. Nelson (Systems Research Laboratories, Inc., Dayton, Ohio) and R. L. Halberg (Dayton, University, Dayton, Ohio). *Human Factors,* vol. 21, Apr. 1979, p. 225-228. 17 refs. Contracts No. F33615-75-C-0127; No. F33615-76-C-0524.

Threshold contrasts for red, green, and achromatic sinusoidal gratings were measured. Spatial frequencies ranged from 0.25 to 15 cycles/deg. No significant differences in contrast thresholds were found among the three grating types. From this finding it was concluded that, under conditions of normal viewing, no significant differences should be expected in the acquisition of spatial information from monochromatic or achromatic displays of equal resolution. (Author)

A79-32640 Very-large-scale integration - What it means for technical systems and humans (Die Grösstintegration - Auswirkungen auf technische Systeme und Menschen). O. G. Folberth (IBM Corp., Armonk, N.Y.). *Elektronik,* vol. 28, Apr. 19, 1979, p. 45-50. 11 refs. In German.

The transition from large-scale to very-large-scale integration (VLSI) is expected to take place in the near future as the technology of integrated circuits continues to advance at a rapid pace. The potential effects of VLSI on future technical systems and on human society are assessed. The reasons for the existing discrepancies in cost reductions among various integrated units are discussed, and the importance of low-cost components in implementing new applications is reviewed. Integration problems in such areas as high power systems are taken into account, as are the projected solutions by means of VLSI. Expected changes in the dimensions of knowledge, the working environment of the circuit designer, and simulation procedures are noted. A.A.

A79-32658 # Medicobiological research within the framework of the scientific program 'Intercosmos' (Medyczno-biologiczne badania w ramach programu naukowego 'Interkosmos'). Z. Sarol. *Astronautyka,* vol. 21, no. 1, 1979, p. 4-7. In Polish.

The present review deals with some recent progress made in the fields of space medicine and biology through joint participation of the socialist block countries within the Intercosmos program. Achievements in the fields of space physiology and radio biology are noted. V.P.

A79-33049 * **Spaceflight and bone turnover - Correlation with a new rat model of weightlessness.** E. R. Morey (NASA, Ames Research Center, Biomedical Research Div., Moffett Field, Calif.). *Bioscience,* vol. 29, Mar. 1979, p. 168-172. 14 refs.

Earlier manned spaceflight studies have revealed that the near-weightless environment of orbital flight produce certain biological effects in humans, including abnormalities in mineral metabolism. The data collected were compatible with bone mineral loss. Cosmos 782 and 936 experiments have shown a decrease in rat bone formation rate. In this paper, a rat model of weightlessness is described, which is unique in that the animal is free to move about a 360-deg arc. The model meets the requirements for an acceptable system. Data from the model and spaceflight are presented. Many of the responses noted in suspended animals indicate that the model closely mimics results from rats and man exposed to near-weightlessness during orbital spaceflight. S.D.

A79-33050 * **The joint US-USSR biological satellite program.** K. A. Souza (NASA, Ames Research Center, Biosystems Div., Moffett Field, Calif.). *BioScience,* vol. 29, Mar. 1979, p. 160-167. 30 refs.

The joint US-USSR biological satellite missions carried out in 1975 and 1977 using Cosmos 782 and Cosmos 936 spacecraft, respectively, is reviewed. The experimental equipment and the biological specimens aboard the aircraft are considered, and it is noted that Cosmos 782, unlike Cosmos 936, carried no centrifuges for rats, although it did contain a centrifuge where a variety of biological specimens, including carrot tissue and fruit flies, were subjected to artificial gravity during space flight. The ground control groups, designed for biological experiments under simulated space-conditions, are taken into account. The U.S. experiments aboard the aircraft are described, with attention given to the experiments with rats, fish embryos, plants, and insects. Results of the experiments are noted, including the finding that space flight factors, especially weightlessness, have a measurable effect on the erythropoietic and musculoskeletal systems of rats. A.A.

A79-33122 # **Amino acids in southern Kamchatka hot springs (Aminokisloty v gidrotermakh iuzhnoi Kamchatki).** L. M. Mukhin, V. B. Bondarev, E. A. Vakin, N. I. Il'iukhina, V. I. Kalinichenko, E. I. Milekhina, and E. N. Safonova (Akademiia Nauk SSSR, Institut Kosmicheskikh Issledovanii, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 244, Feb. 1, 1979, p. 974-977. 9 refs. In Russian.

In the study described, chromatography and mass spectrometry were used to analyze specimens taken from seven hot springs and two geothermal wells on the territory of southern Kamchatka. The procedures used in the analysis are outlined, and the content of amino acids is tabulated for each specimen. V.P.

A79-33186 # **Incidence of cardiovascular problems among flying personnel and their evaluation.** R. S. Hoon. *Aviation Medicine,* vol. 22, June 1978, p. 3-8.

The tremendous advances in medical electronics and biomedical engineering have aided the aeromedical authorities in getting a clearer understanding of myocardial function and hemodynamic phenomena at rest, under stress and in various disease conditions. The paper examines the incidence of cardiovascular problems in flying personnel, along with noninvasive methods of evaluating cardiovascular disorders. A reasonable estimate of the incidence is made by considering three aspects: hospital admissions, incapacitation, and mortality data. Suggestions for modifications in the light of advances in developed countries include an investigational program based on versatile objective noninvasive methodology of high reliability and efficiency. S.D.

A79-33187 # **Ensuring medical fitness on entry and during service in aircrew in IAF.** J. S. Sant (Indian Air Force, Institute of Aviation Medicine, Bangalore, India). *Aviation Medicine,* vol. 22, June 1978, p. 9-12.

The primary function of the medical branch of the Indian Air Force (IAF) is to keep the aircrew in top physical and mental condition in order to assure high operational efficiency of the force. The paper describes a proper medical evaluation system at various stages of service career. Such a system is discussed in terms of its constituent parts: entry medical evaluation, annual medical examination, daily preflight checks, and assessment of physical and mental disabilities at regular intervals in specialized centers. Fits and psychiatric disorders are also considered. S.D.

A79-33188 # **Obesity and flying fitness.** S. Krishnamurthi (Indian Air Force, Command Hospital, Bangalore, India). *Aviation Medicine,* vol. 22, June 1978, p. 24-27. 8 refs.

Obesity poses the greatest danger to the flight personnel because in terms of flying fitness, the obese person has poor tolerance to G forces, altitude and decompression; he is less mobile and agile and is more susceptible to locomotion dysfunctions. Attention is given to assessment of the fat patient, incidence of obesity, obesity evaluation, and management of obesity (dieting, drug administration, exercising, and psychotherapy). When there is more than 30% departure from ideal weight and conventional measures have failed, fasting and surgery are indicated. S.D.

A79-33189 # **Accident injuries and flying fitness.** U. S. Pruthi (Indian Air Force, New Delhi, India). *Aviation Medicine,* vol. 22, June 1978, p. 28-30.

One of the important aspects of aircrew health care and flight fitness is prevention of injuries and reduction of nonflying period after injury. The paper describes the assessment of head injuries, spinal injuries, and limb injuries (upper and lower limbs). Due to stringent flight safety measures, aircraft accidents have been reduced to half in 1976 and one-third in 1977 as compared to previous years. However, off-duty motorcycle and scooter accidents still constitute half the number of injured flight personnel. S.D.

A79-33190 # **Ageing and flying fitness.** M. L. Wadhawan (Armed Forces Medical College, Poona, India). *Aviation Medicine,* vol. 22, June 1978, p. 31-33. 7 refs.

The paper assesses the influence of aging on the flying performance of aircrew members with a view to reveal the changes in physiological functions for age groups between 20 and 40 years, the age span in which operational (military) flying is normally performed. Attention is given to changes in the cardiovascular, pulmonary and cerebrocirculatory systems, along with emotional stresses and changes in the CNS. It is concluded that aging brings about physiological deterioration, most probably due to repeated exposure to various adverse flight stresses. S.D.

A79-33191 # **Electrocardiographic abnormalities in Air Force personnel.** J. C. Chatterji, B. K. Das, and M. Akhtar (Army Hospital, Delhi, India). *Aviation Medicine,* vol. 22, June 1978, p. 34-41. 26 refs.

The paper is concerned with Air Force personnel subject to evaluation of ischemic heart disease or nonspecific asymptomatic ECG abnormality during the period 1973-1977. Available case details including ECGs and other investigations carried out in the past were thoroughly scrutinized for each patient. Detailed history and clinical examination findings were recorded and fresh relevant analyses including serum cholesterol, blood uric acid, standard glucose tolerance test, chest X-rays, and 12-lead resting ECG were performed prior to subjecting a patient to conventional stress tests. The results suggest that evaluation of nonspecific ECG abnormalities in asymptomatic young service personnel should be done with the utmost care, keeping in mind the service requirements, career of the individual, and risks involved. S.D.

A79-33192 # **Disability pattern amongst civil aircrew.** S. K. Mukerjee and V. K. Seth (Indian Air Force, New Delhi, India). *Aviation Medicine,* vol. 22, June 1978, p. 46-49.

The paper examines the medical records of 291 civil aircrews who have been medically unfit for flying due to various disabilities

during the period January 1969 to December 1976. The disabilities considered are diabetes mellitus/GTT abnormalities, IHD/miocardial infarction/ECG abnormality, hepatomegaly, psychiatric disabilities, alcoholism, other medical disabilities, eye disabilities, ENT disabilities, and surgical disabilities. Cases of temporary and permanent unfitness, single and combined disabilities, distribution of disabilities among pilots and other aircrew members, and other cases are tabulated. It is concluded that many of the disabilities are preventable or curable in time. S.D.

A79-33193 # **Human error accidents - Some case studies.** V. Chellappa (Civil Aviation Department, New Delhi, India). *Aviation Medicine,* vol. 22, June 1978, p. 50-52.

A study is made of about 250 aircraft accidents that occurred during the period 1967-1977 in India. The discussion covers classification of pilot error accidents, accident rates, public transport aircraft accidents, serial operation aircraft accidents, and training flight aircraft accidents. It is suggested that it would be beneficial to set up a representative body of experts from the Air Force, civil aviation and airlines for an in-depth study of the human factors involved in Air Force and civil aviation aircraft accidents in the context of environment, training facilities, working and climatic conditions, and national customs with a view toward making adequate recommendations. S.D.

A79-33194 # **Cases of probable Aero Otitis interna.** K. J. S. Ahluwalia (Army Hospital, Delhi, India) and H. K. Agarwal (Indian Air Force, New Delhi, India). *Aviation Medicine,* vol. 22, June 1978, p. 59-62.

Seven case reports are presented to substantiate that damage can occur to the inner ear due to barotrauma. Four cases are Indian Air Force personnel who underwent rapid descent but did not give any history of forced valsalva. The 5th case also had middle ear barotrauma. The 6th case is a naval officer, and the 7th case is a young girl who developed inner ear symptoms on a commercial airline flight. It is reported that middle ear damage in otitic barotrauma is due to a negative pressure produced during descent when eustachian tubes fail to equalize the air pressure in the middle ear with that of the outer atmosphere. It is postulated that a sudden change of pressure in the inner ear by any cause can lead to ear damage by rupture of the round window membrane or stapes subluxation resulting in deafness. S.D.

A79-33602 USAF life support system 412A - 1978 corporate report. J. J. McCambridge (USAF, Aeronautical Systems Div., Wright-Patterson AFB, Ohio). In: Survival and Flight Equipment Association, Annual Symposium, 16th, San Diego, Calif., October 8-12, 1978, Proceedings. Canoga Park, Calif., Survival and Flight Equipment Association, 1979, p. 4-6.

Progress, programs, and plans for USAF life support system development are surveyed. Consideration is given to such specific programs as the Advanced Concept Ejection Seat the PLZT flashblindness protection goggles, chemical defense, the HGU-12P oxygen mask, the Survival Avionics System, the Open Loop Oxygen Generating System, the Automatic Inflation Modulation parachute, the F-111 crew restraint system, and the high-G protective system. B.J.

A79-33621 Oral/nasal breathing systems in the year 2000. A. Bloom (Sierra Engineering Co., Sierra Madre, Calif.). In: Survival and Flight Equipment Association, Annual Symposium, 16th, San Diego, Calif., October 8-12, 1978, Proceedings. Canoga Park, Calif., Survival and Flight Equipment Association, 1979, p. 123-125.

Among the possible innovations in breathing systems for general aviation and commercial aircraft by the year 2000 are sequentially activated chlorate solid-state oxygen systems, lighter weight masks employing combinations of plastics and elastomers, and optically clear silicone goggles. Electrochemical oxygen generators, anti-smoke goggles, and electronically controlled valving for pressured inspiration are also foreseen. J.M.B.

A79-33625 An overview of helicopter mission specific survival equipment. G. P. Gillespie (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). In: Survival and Flight Equipment Association, Annual Symposium, 16th, San Diego, Calif., October 8-12, 1978, Proceedings. Canoga Park, Calif., Survival and Flight Equipment Association, 1979, p. 150-154. 5 refs.

Heavy, bulky life support equipment designed for the fighter/attack aircrewman has often proved detrimental to the efficiency and endurance of helicopter crewmen. A less bulky life preserver and a revised set of survival aids (radio beacon, flares, strobe light and dye markers) are among the equipment changes proposed for helicopter crews in this paper. A small storable life raft made from an aluminized nylon material is also included in the redesigned helicopter survival equipment package. J.M.B.

A79-33632 Better definition of eye to aortic valve distance in high acceleration cockpit /HAC/ seating geometries. J. W. Burns and J. E. Whinnery (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: Survival and Flight Equipment Association, Annual Symposium, 16th, San Diego, Calif., October 8-12, 1978, Proceedings. Canoga Park, Calif., Survival and Flight Equipment Association, 1979, p. 192, 193.

The distance between the eye and the aorta was measured by radiography of seven males with prosthetic heart valves. A radiopaque marker at the lateral epicanthus of the eye provided the eye marker in the X-rays. Since a relationship between hydrostatic column height from the eye to the aorta and relaxed acceleration tolerance at various seatback angles has been established, the radiographically determined distances could be used as an aid in selecting an optimal seating geometry for high-acceleration aircraft cockpits. J.M.B.

A79-33633 Current trends in UK military aircrew survival equipment. J. L. Waddell (Ministry of Defence, London, England). In: Survival and Flight Equipment Association, Annual Symposium, 16th, San Diego, Calif., October 8-12, 1978, Proceedings. Canoga Park, Calif., Survival and Flight Equipment Association, 1979, p. 198-202. 6 refs.

Policies in the development of personal survival equipment for U.K. military aircrew forced to abandon their aircraft, particularly at sea, are outlined. Efforts are currently under way to standardize the types of life preservers in use and to develop a life preserver for the crews of fixed wing aircraft capable of providing automatic assistance to possible injured crew members. The soft personal survival pack (PSP), a pack forming part of the seat and containing a life raft and other survival equipment, has been replaced by a rigid model in order to reduce back injuries during ejection. Life rafts composed of synthetic materials have been introduced and supplied with additional equipment. Basic and supplemental survival aids included in the PSP are listed, noting that they have been based on a temperate environment. A.L.W.

A79-33634 U.S. Navy development of an on-board oxygen generation /OBOG/ system. M. J. Lamb (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). In: Survival and Flight Equipment Association, Annual Symposium, 16th, San Diego, Calif., October 8-12, 1978, Proceedings. Canoga Park, Calif., Survival and Flight Equipment Association, 1979, p. 203-208. 10 refs.

Development work conducted by the Naval Air Development Center on an onboard oxygen generation (OBOG) system for tactical naval aircraft, in order to eliminate liquid oxygen installations currently carried on ships, is presented. Systems utilizing reversible sorption of pure oxygen by fluomine, electrochemical separation of pure oxygen and a zeolite molecular sieve to separate oxygen (95%) and argon from engine bleed air have been developed. Aircraft/

OBOG system integration studies have determined that all these systems could be accommodated into the F-14 aircraft, however, resource requirements are not available in all candidate aircraft. Laboratory tests produced unsatisfactory results for the electrochemical system, while tests of the other systems have been successful, leading to successful physiological tests of both systems and flight tests which are presently being conducted. A.L.W.

A79-33638 The objective evaluation of aircrew protective breathing equipment. III - Improved types of mask/goggles combinations. IV - Fullface masks and hoods suitable for flight attendant use. D. deSteiguer, M. S. Pinski, S. R. Bryant, and E. B. McFadden (FAA, Protection and Survival Laboratory, Oklahoma City, Okla.). In: Survival and Flight Equipment Association, Annual Symposium, 16th, San Diego, Calif., October 8-12, 1978, Proceedings. Canoga Park, Calif., Survival and Flight Equipment Association, 1979, p. 266-272. 11 refs.

Results of tests of prototype mask/goggles combinations for flight deck crewmembers and fullface masks and hoods for flight attendants for use as protective breathing equipment are presented. Tests were conducted in an exposure chamber filled with 120 ppm n-pentane in order to evaluate contaminant leak protection. For the mask/goggles combinations, all tests were done with male subjects wearing eyeglasses and all reported combinations have been found to meet the proposed acceptance criteria. Every acceptable device has required some amount of positive pressure within the device, necessitating the inclusion of a regulator with a specified positive pressure output in each device. Fullface masks and hoods were tested on male and female subjects wearing and not wearing eyeglasses. Fullface masks and the single hood tested were found to provide acceptable contaminant protection only when set at positive pressure. A.L.W.

A79-33641 Improved headgear for fixed wing Navy aircrewmen. J. W. Castine (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). In: Survival and Flight Equipment Association, Annual Symposium, 16th, San Diego, Calif., October 8-12, 1978, Proceedings. Canoga Park, Calif., Survival and Flight Equipment Association, 1979, p. 282-285. 6 refs.

An integrated helmet/oxygen mask/communications system is being developed for pilots of high-performance aircraft with sustained high-acceleration capability. A series of impact studies involving deformable and non-deformable impactors has suggested that lightweight helmets can provide good protection for some types of impact. Form fitting techniques for helmet design are mentioned, and a correction for the previously misplaced center of gravity in the helmets is described. J.M.B.

A79-33642 Test and evaluation in the acquisition process - A look at the PLZT goggle. S. C. Puma (USAF, Test and Evaluation Center, Kirtland AFB, N. Mex.). In: Survival and Flight Equipment Association, Annual Symposium, 16th, San Diego, Calif., October 8-12, 1978, Proceedings. Canoga Park, Calif., Survival and Flight Equipment Association, 1979, p. 286-288. 6 refs.

Acquisition programs for military hardware include a developmental test and evaluation program performed under the supervision of the contract agency (usually on prototype equipment), and an operational test and evaluation program carried out by military personnel. The testing and evaluation process for a ceramic helmet-mounted thermal/flash protective goggle is described. Developmental evaluation included use of the goggle by test pilots during night or marginal weather. Problems associated with lens cracking of the goggle are also mentioned. J.M.B.

A79-33643 Test and evaluation process for life support systems. J. Harding (U.S. Naval Material Command, Naval Air Development Center, Warminster, Pa.). In: Survival and Flight Equipment Association, Annual Symposium, 16th, San Diego, Calif., October 8-12, 1978, Proceedings. Canoga Park, Calif., Survival and Flight Equipment Association, 1979, p. 289-292.

The test and evaluation process has become a mandatory adjunct to research and development programs for military hardware. In this paper, particular attention is given to the test and evaluation of life-support systems, which are generally among the less costly and less complex acquisitions. Greater reliability, increased rates of user acceptance, lower incidence of failure, easier maintenance, and improved documentation for user and maintenance manuals result from the test and evaluation process. J.M.B.

A79-33645 The fitting of Canadian Forces aircrew helmets - Why the difference. J. A. Winship and G. Humphreys (Defence and Civil Institute of Environmental Medicine, Downsview, Ontario, Canada). In: Survival and Flight Equipment Association, Annual Symposium, 16th, San Diego, Calif., October 8-12, 1978, Proceedings. Canoga Park, Calif., Survival and Flight Equipment Association, 1979, p. 305-307.

For the past 20 years, Canadian Forces aircrew have been wearing a suspension helmet which was originally designed for high performance jet environment and later adapted to helicopter and fixed-wing propeller aircraft operations. The helmet, with minor modifications (to improve it) has provided excellent protection to aircrew experiencing a wide variety of emergency and accident situations. From the study of 1977 Canadian Forces aircraft accidents, it has been seen that high performance jet aircrew may be receiving better head protection during accidents than aircrew of other types. A comparative survey of helmet fitting, use and care, has demonstrated differences between the two types of flying environment; differences in head protection are discussed in relation to differences in the requirements and use of the equipment. (Author)

A79-33650 No harmful effects through infrared light emitting diodes (Keine Augenschäden durch Infrarot-Lumineszenzdioden). *Nachrichten Elektronik,* vol. 33, Apr. 1979, p. 131, 132. In German.

A research study on the effects of infrared LEDs (IRLEDs) on the eyes is reviewed. The temperature increase in the retina induced by radiation was used to estimate the critical limiting output of IRLEDs in relation to the eye. The common Standard IRLEDs with a chip size of 0.4 x 0.4 sq mm were found to have a radiation power of about 20 mV which remains well below the critical limiting value. A.A.

A79-33711 # Biological effects of electromagnetic fields (Biologische Wirkungen elektromagnetischer Felder). J. Bernhardt (Erlangen-Nürnberg, Universität, Erlangen, West Germany). *(Arbeitsgemeinschaft Ionosphäre, URSI, and Nachrichtentechnische Gesellschaft, Gemeinsame Tagung, Kleinheubach, West Germany, Oct. 2-6, 1978.) Kleinheubacher Berichte,* vol. 22, 1979, p. 99-112. 51 refs. In German.

A review of research on the interaction of electromagnetic fields with biological systems is presented. Attention is focused just on direct influences on biological cells and tissues and only on phenomena for which biophysical approximations could be developed. Electrically and magnetically induced current densities in man are compared with natural electric current densities. For radiation below 100 kHz a lower limit to field strength is given, below which one can exclude the possibility of damage to the central nervous system. P.T.H.

A79-33712 # Biological effects of electromagnetic fields (Biologische Effekte elektromagnetischer Felder). D. Gossel (Philips Forschungslaboratorium Hamburg GmbH, Hamburg, West Germany). *(Arbeitsgemeinschaft Ionosphäre, URSI, and Nachrichtentechnische Gesellschaft, Gemeinsame Tagung, Kleinheubach, West Germany, Oct. 2-6, 1978.) Kleinheubacher Berichte,* vol. 22, 1979, p. 113-124. 90 refs. In German.

Nonthermal low-level field effects in man are reviewed and selected from a limited number of rather well documented recent investigations. Contrasting biometeorological conditions met with in nature, the paper describes experiments under almost constant conditions applying artificially generated atmospherics or similar

signals. The effects of small atmospheric ions are derived from their electrostatic properties. Some ideas on the physiological mechanisms involved, on future developments as well as on potential applications are briefly discussed. (Author)

A79-33713 # Effect of electromagnetic fields in long-, medium-, and short-wave ranges on biological objects (Einflüsse von elektromagnetischen Feldern in den Lang-, Mittel- und Kurzwellenbereichen auf biologische Komponenten). B. Raufmann (Institut für Rundfunktechnik, Munich, West Germany). *(Arbeitsgemeinschaft Ionosphäre, URSI, and Nachrichtentechnische Gesellschaft, Gemeinsame Tagung, Kleinheubach, West Germany, Oct. 2-6, 1978.) Kleinheubacher Berichte,* vol. 22, 1979, p. 125-132. 7 refs. In German.

Electric and magnetic fields of high-frequency of up to 500 kV/m and 5000 A/m were generated in the object space of a microscope. Studies of the influence of these fields on bacteria, vegetable cells, animal cells and other biological objects showed microscopically visible reactions only in electric fields. The amplitude- and frequency responses of those phenomena were investigated systematically and led to remarkably similar characteristics of the different biological areas and the different types of reactions. Explanations of the measurements and their results are given as well as original photos showing the reactions of different biological specimens in electric fields. (Author)

A79-33803 * Sweating responses during heat acclimation and moderate conditioning. E. Shvartz, A. Bhattacharya, S. J. Sperinde, P. J. Brock, D. Sciaraffa, and W. Van Beaumont (NASA, Ames Research Center, Biomedical Div., Moffett Field, Calif.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 46, Apr. 1979, p. 675-680. 18 refs.

Experiments were conducted on ten young male subjects to determine sweating onset, distribution, and patterns as well as the relationships of these responses to body temperature during heat acclimation and moderate conditioning performed in temperate (24 C) conditions. The subjects are randomly assigned to two groups of five subjects each. The experimental period consisted of eight successive days of either graded exercise to exhaustion on a bicycle ergometer in heat (acclimation group) or in a temperate environment (control group). Major conclusions are that (1) acclimation and conditioning result in relatively more sweat rate on the limbs than on the torso, but that these changes are less related to body temperature than torso sweat rate; and (2) sweating sensitivity increases during acclimation and conditioning, but its contribution to heat acclimation is minor. S.D.

A79-33804 Fluid shifts during initial phase of immersion diuresis in man. S. S. Khosla and A. B. DuBois (John B. Pierce Foundatior Laboratory, New Haven, Conn.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 46, Apr. 1979, p. 703-708. 22 refs. Grant No. NIH-HL-17407.

The object was to study shifts in man during the 1st hour of immersion diuresis. Control experiments were done on subjects lying down in air for 4 h with and without vasopressin. During immersion up to the neck, seven of nine subjects had significant diuresis and natriuresis. In the first 20 min of sitting in 33 C water, a hemodilution of 2% of blood volume was observed. As diuresis progressed, hemoconcentration began. When vasopressin was given just before immersion to prevent the diuresis, the hemodilution observed was greater and lasted longer. Thus the hematocrit fell by 1.7 U, plasma osmolality by 6.0 mosmol/kg, plasma proteins by 0.33 g/100 ml, and plasma sodium by 5.0 meq/l. It is concluded that a hemodilution of about 4% of blood volume occurs during the early phase of immersion and the degree of hyposmolality observed suggests that the fluid shifted was more hyposmotic than the interstitial fluid alone, possibly because some intracellular water may have shifted into the bloodstream during immersion. (Author)

A79-33805 Contribution of rib cage and abdomen-diaphragm to tidal volume during CO2 rebreathing. L. D. Pengelly, A. M. Tarshis, and A. S. Rebuck (McMaster University, Hamilton, Ontario, Canada). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 46, Apr. 1979, p. 709-715. 24 refs. Medical Research Council of Canada Grant No. MA-4372.

A79-33806 Changes in lung volume, lung density, and distribution of ventilation during hypobaric decompression. G. Coates, G. Gray, A. Mansell, C. Nahmias, A. Powles, J. Sutton, and C. Webber (McMaster University, Medical Centre, Hamilton, Ontario, Canada). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 46, Apr. 1979, p. 752-755. 19 refs. Research supported by the Ontario Heart Foundation and Canadian Defence and Civil Institute of Environmental Medicine.

A hypobaric-decompression experimental study was conducted on four healthy male volunteers (30-39 yr) at a barometric pressure of 446 torr (equivalent altitude 4268 m) for 24 hr. Decompression to this pressure took 28 min and the duration of exposure to altitude refers to time elapsed after this interval. Attention is focused on a study of the effects of decompression on lung volume, the distribution of inspired gas, lung blood volume, and lung mass. The results obtained show increases in gas trapping and maldistribution of inspired gas during decompression in a hypobaric chamber. At the same time there is an increase in lung density but no change in total pulmonary blood volume. The results confirm increases in lung distensibility during acute hypoxia as well as occurrence of subclinical pulmonary edema after rapid ascent to high altitude. S.D.

A79-33807 Control of skin blood flow during exercise - Thermal and nonthermal factors. M. F. Roberts (John B. Pierce Foundation Laboratory, New Haven, Conn.) and C. B. Wenger (Yale University, New Haven, Conn.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 46, Apr. 1979, p. 780-786. 30 refs. Grants No. NIH-ES-00123; No. NIH-ES-00354.

Experiments were performed on six healthy male volunteers exercising on a bicycle ergometer at 25 C and intensities of 70-100% of maximal oxygen uptake. The objective was to determine whether decrements in skin blood flow that occur early in exercise reflect a nonthermal vasomotor reflex which is sustained throughout exercise at moderate skin temperature. It is shown that after the first 0.5 min of exercise in a moderate ambient temperature, skin blood flow over most of the body is not reduced below values found at the same internal and skin temperatures during rest. S.D.

A79-33808 Effects of chronic changes in hemoglobin-O2 affinity in rats. B. P. Teisseire, C. D. Soulard, R. A. Hérigault, L. F. Leclerc, and M. B. Laver (Hôpital Henri Mondor, Créteil, Val-de-Marne, France; Harvard University, Boston, Mass.). *Journal of Applied Physiology: Respiratory, Environmental and Exercise Physiology,* vol. 46, Apr. 1979, p. 816-822. 28 refs. Délégation Générale à la Recherche Scientifique et Technique Contract No. 77-7-1035.

Three groups of ten albino rats (mean initial body weight 73.2 plus or - 3.8 g) were subjected to chronic (5 times/week for 16 weeks) intraperitoneal administration of sodium cyanate (NACNO, 90 mg/kg; P(50) decreased), o-iodosodium benzoate (OISB, 300 mg/kg; P(50) increased), and sodium chloride (NaCl; P(50) unchanged). At the end of this period the animals were exposed to a low inspired O2 concentration and subjected to exercise stress. The objective was to evaluate the consequences of a chronic drug-induced change in O2 affinity. To this end, measurements were made of P(50) and other O2 transport-affecting variables including Hill's n, the saturation dependency of the Bohr factor, and several metabolic factors including growth and ability to withstand acute physical stress during chronic NaCNO and OISM treatment. It is concluded that evaluation of the physiological consequences depending on changes in the PO2-percent oxyhemoglobin saturation relationship must include all factors responsible for this association, not simple P(50). S.D.

A79-33948 **A two-stage model of visual search.** J. E. Hoffman (Delaware, University, Newark, Del.). *Perception and Psychophysics,* vol. 25, no. 4, Apr. 1979, p. 319-327. 21 refs. Grant No. NIH-MH-27110.

A two-stage visual search model is described. Four experiments show that in a VM paradigm sequential presentation of the display leads to increases in accuracy and decreases in latency. Slower presentation rates allow for faster transfer of the target from iconic to short-term memory. When target and background items are dissimilar, transfer to short-term memory need not take place and decisions can be made on the basis of the Stage 1 analysis. These results are taken as confirming evidence for the proposed model. (Author)

A79-33949 **A further investigation of visual dominance.** F. B. Colavita and D. Weisberg (Pittsburgh, University, Pittsburgh, Pa.). *Perception and Psychophysics,* vol. 25, no. 4, Apr. 1979, p. 345-347. 7 refs.

It has previously been shown that when human subjects are presented simultaneously with a light and a tone, each of which serve as a cue in a reaction time task, the subjects respond predominantly to the light. This visual dominance effect may be due to the 'hard wiring' of the sensory systems involved, or the effect may be nonsensory in nature, being based on decisional or attentional factors. The present experiment suggests that visual dominance has a nonsensory basis, in that the effect is even more evident when subjects respond to stimulus offset rather than stimulus onset. (Author)

A79-34172 **Application of computer animation for dynamic display in complex energy systems.** R. B. Jones (Sandia Laboratories, Albuquerque, N. Mex.). In: Alternative energy sources; Proceedings of the Miami International Conference, Miami Beach, Fla., December 5-7, 1977. Volume 10. Washington, D.C., Hemisphere Publishing Corp., 1978, p. 4799-4817. 7 refs. Contract No. AT(29-1)-789.

The potential impact of visual display techniques for improvement of human performance in complex energy systems is discussed. The logical decomposition of human stimuli/response is also discussed in the context of information display. An example of pictorial display is given. Computer generated films of abstract phenomena are shown to have a potential impact in training of complex energy system operators. One such film is discussed. The results of a questionnaire given to an audience is assessed with respect to retention and comprehension of the film's contents. (Author)

A79-34284 **Predicting coronary artery disease with treadmill stress testing - Changes in R-wave amplitude compared with ST segment depression.** G. W. Christison, P. E. Bonoris, P. S. Greenberg, M. J. Castellanet, and M. H. Ellestad (Memorial Hospital Medical Center, Long Beach, Calif.). *Journal of Electrocardiology,* vol. 12, Apr. 1979, p. 179-185. 28 refs.

A79-34375 **Perception of continuity in stroboscopic motion - A temporal frequency analysis.** M. J. Morgan (Durham, University, Durham, England). *Vision Research,* vol. 19, no. 5, 1979, p. 491-500. 25 refs.

A target moving periodically in discrete spatial steps, so as to be seen in horizontal apparent motion, is perceived as being shifted in depth if each step occurs slightly later in one eye than in the other. This apparent-motion of the Pulfrich stereophenomenon can be understood if the momentary visual direction of the target is determined during an integration period that is sufficiently long to include more than one spatial step. It can be predicted that the depth effect will be reduced when the temporal interval between successive spatial steps of the target exceeds a critical value which is greater than the integration period. This is so, and the critical value is in the region of 30-50 msec. It may be further predicted that this critical value will be decreased as a function of light adaptation, and this was also verified. These results cannot be accounted for by a simple monocular delay model. The present analysis of the depth-by-delay effect suggests a more general treatment of apparent motion, which can be considered to be indistinguishable from continuous motion to the extent that the visual system shows low-pass temporal frequency filtering. (Author)

A79-34424 **The interpretation of visual motion.** S. Ullman (MIT, Cambridge, Mass.). Research supported by the Advanced Research Projects Agency and National Science Foundation; NSF Grant No. MCS-77-07569; Contract No. N00014-75-C-0643. Cambridge, Mass., MIT Press, 1979. 241 p. 82 refs. $17.50.

The book uses the methodology of artificial intelligence to investigate the phenomena of visual motion perception: how the visual system constructs descriptions of the environment in terms of objects, their three-dimensional shape, and their motion through space, on the basis of the changing image that reaches the eye. Two major problems are treated: (1) the correspondence problem, which concerns the identification of image elements that represent the same object at different times, thereby maintaining the perceptual identity of the object in motion or in change; and (2) the three-dimensional interpretation problem, intended to interpret the changing image once a correspondence has been established. Attention is given to the minimal mapping theory of motion correspondence and to the preception of motion from structure. S.D.

A79-34464 # **Chirality of compounds essential for the existence of life, and the possibility of its evolution in the universe.** O. Wolczek (Polskie Towarzystwo Astronautyczne, Warsaw, Poland). *Postepy Astronautyki,* vol. 11, no. 4, 1978, p. 53-80. 70 refs.

Several proposed mechanisms for the generation of privileged chirality of biologically important molecules are critically examined and rejected. According to the author's opinion, discrimination in favor of a particular chirality reflects the deviation from symmetry typical of nonliving matter as well, where it manifests itself on the smallest scale (nonconservation of parity in weak interactions) and on the largest scale (existence of matter but almost complete nonexistence of antimatter in the universe). P.T.H.

A79-34506 # **Control theory and biosystems: Analysis of homeostatic properties (Teoriia upravleniia i biosistemy: Analiz sokhranitel'nykh svoistv).** V. N. Novosel'tsev. Moscow, Izdatel'stvo Nauka, 1978. 320 p. 369 refs. In Russian.

The book outlines methods of control theory and their application to the investigation of biological systems. Basic concepts of the state-space method and compartmental modeling of biosystems are presented. These methods are used to analyze the homeostatic (dynamic equilibrium) of biological systems. The text is supplemented by illustrative examples from the field of physiology (systems of thermoregulation, oxygen exchange, energy balance) and other fields of biology. S.D.

A79-34520 * # **A rationale for human operator pulsive control behavior.** R. A. Hess (NASA, Ames Research Center, Moffett Field, Calif.). *Journal of Guidance and Control,* vol. 2, May-June 1979, p. 221-227. 12 refs.

When performing tracking tasks which involve demanding controlled elements such as those with K/s-squared dynamics, the human operator often develops discrete or pulsive control outputs. A dual-loop model of the human operator is discussed, the dominant adaptive feature of which is the explicit appearance of an internal model of the manipulator-controlled element dynamics in an inner feedback loop. Using this model, a rationale for pulsive control behavior is offered which is based upon the assumption that the human attempts to reduce the computational burden associated with time integration of sensory inputs. It is shown that such time integration is a natural consequence of having an internal representation of the K/s-squared-controlled element dynamics in the dual-loop model. A digital simulation is discussed in which a modified form of the dual-loop model is shown to be capable of producing pulsive control behavior qualitively comparable to that obtained in experiment. (Author)

A79-34842 # **Systems integration in the development of controlled ecological life support systems.** J. L. Carden (Georgia Institute of Technology, Atlanta, Ga.). *Princeton University and American Institute of Aeronautics and Astronautics, Conference on Space Manufacturing Facilities, 4th, Princeton University, Princeton, N.J., May 14-17, 1979, AIAA Paper 79-1406.* 3 p.

A brief summary is presented for the conclusions of the systems engineer group at the NASA workshop, 'Guiding the Development of a Controlled Ecological Life Support System (CELSS)'. The discussion of mechanisms has led to the identification of two types of systems required early in the CELSS development effort: (1) a centralized information storage and exchange system available to all CELSS researchers; and (2) a mechanism for establishing data quality requirements and assuring that all CELSS research meets these requirements. In addition, both systems are intended to assure maximum computational, modeling, and measurements compatibility within the CELSS program to simplify the ultimate integration of CELSS subsystems. The general modeling approaches required for CELSS development and operation are dictated by the nature of the system, i.e., a tightly controlled mass recycling system. S.D.

A79-34843 # **Waste treatment options for use in closed systems.** M. L. Shuler (Cornell University, Ithaca, N.Y.). *Princeton University and American Institute of Aeronautics and Astronautics, Conference on Space Manufacturing Facilities, 4th, Princeton University, Princeton, N.J., May 14-17, 1979, AIAA Paper 79-1409.* 8 p. 17 refs.

The key requirements placed on waste processing in a closed ecological life support system (CELSS) are discussed. Candidate systems are delineated. Wet oxidation processes (representing a physical chemical approach) are contrasted with non-photosynthetic aerobic microbial waste treatment (representing a biologically-centered option) using the key requirements generated in the beginning of the paper. Too many unknowns exist to select a 'best' option. Generally wet oxidation processes might be anticipated to be more efficient, but the form of the outputs from biological processing may be more compatible with objectives such as providing a hydroponics solution for plant growth. Substantial experimental programs will be necessary to insure selection of a 'best' choice.

(Author)

A79-34853 # **Consciousness alteration in space.** B. J. Bluth (California State University, Northridge, Calif.). *Princeton University and American Institute of Aeronautics and Astronautics, Conference on Space Manufacturing Facilities, 4th, Princeton University, Princeton, N.J., May 14-17, 1979, AIAA Paper 79-1430.* 9 p. 27 refs.

The problem of personnel experiencing altered states of conciousness leading to dangerous states of disorientation upon exposure to the space environment is considered in view of future missions requiring large numbers of people to be sent into space. It has been noted that the space experience has had effects on every astronaut, leading to peak experiences for some. Research into the altered states of consciousness of intuition, mystical ecstasy and peak experiences shows that such states are not random, spontaneous or caused by external stimuli, but are related to the motivation, personality and prior training of the subject. The source of reality perception, however, has been shown to be a function of social interaction and thus extreme disorientation and loss of reality perception is preventable in a space situation by pre-flight training. A.L.W.

A79-34982 * # **Advanced teleoperators.** A. K. Bejczy (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *Astronautics and Aeronautics,* vol. 17, May 1979, p. 20-31. 33 refs. Contract No. NAS7-100.

Advanced teleoperators are discussed, with emphasis on the remote manipulation system designed to perform such actions as grasping, orienting, moving, placing, and inserting objects. Geometrical performance dimensions are considered, indicating that a manipulator is limited to three-orders-of-magnitude ratio of workspace extension to positioning accuracy. The control system is examined, showing that a manipulative task requires coordination of several joints, with the relationship between the task definers and the joint variables given by complex trigonometrical transformations. Control modes developed in the last 30 years are noted, including program controlled industrial 'robots' which can endlessly repeat a fixed sequence of motions without operator intervention, and the sensor-referenced/computer-controlled mode manipulators. Advanced proximity sensor systems are taken into account, with emphasis on the applications of the force-torque and slip models. The proximity sensor system for the shuttle-size manipulator is described. A.A.

A79-34984 * # **Robotic vision.** D. S. Williams, J. M. Wilf, R. T. Cunningham, and R. Eskenazi (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *Astronautics and Aeronautics,* vol. 17, May 1979, p. 36-41. 9 refs.

Robotic vision, involving the use of a vision system to control a process, is discussed. Design and selection of active sensors employing radiation of radio waves, sound waves, and laser light, respectively, to light up unobservable features in the scene are considered, as are design and selection of passive sensors, which rely on external sources of illumination. The segmentation technique by which an image is separated into different collections of contiguous picture elements having such common characteristics as color, brightness, or texture is examined, with emphasis on the edge detection technique. The IMFEX (image feature extractor) system performing edge detection and thresholding at 30 frames/sec television frame rates is described. The template matching and discrimination approach to recognize objects are noted. Applications of robotic vision in industry for tasks too monotonous or too dangerous for the workers are mentioned. A.A.

A79-34985 * # **Construction in space - Toward a fresh definition of the man/machine relation.** H. H. Watters and J. W. Stokes (NASA, Marshall Space Flight Center, Huntsville, Ala.). *Astronautics and Aeronautics,* vol. 17, May 1979, p. 42-45, 63.

The EVA (extravehicular activity) project forming part of the space construction process is reviewed. The manual EVA construction, demonstrated by the crew of Skylab 3 by assembling a modest space structure in the form of the twin-pole sunshade, is considered, indicating that the experiment dispelled many doubts about man's ability to execute routine and contingency EVA operations. Tests demonstrating the feasibility of remote teleoperator rendezvous, station keeping, and docking operations, using hand controllers for direct input and television for feedback, are noted. Future plans for designing space construction machines are mentioned. A.A.

A79-34990 # **The development of integrated multidimensional displays.** R. G. Pachella and P. Somers (Michigan, University, Ann Arbor, Mich.). *Naval Research Reviews,* vol. 31, Nov. 1978, p. 19-32.

Multidimensional displays presenting real-time integrations of information about complex systems have been made possible by the recent availability of computerized graphic devices. The design of such displays requires consideration of the way in which the spatial configurations of the display are organized in the field of vision of observers. Integrality, the extent to which pattern components coalesce to form a unitary whole, is one measure of the effectiveness of a display image; a high degree of integrality often interferes with the observer's ability to ignore irrelevant information. A technique for describing in physical terms the most perceptually salient features of patterns is presented as a means of designing displays that circumvent problems of integrality. J.M.B.

A79-35121 # **Effects of vestibular stimuli on the electrical activity of muscles (Vliianie vestibuliarnykh razdrazhenii na elektricheskuiu aktivnost' myshts).** E. V. Lapaev, V. I. Zorile, G. I. Pavlov, and F. B. Solodkov. *Fiziologiia Cheloveka,* vol. 5, Mar.-Apr. 1979, p. 270-275. 35 refs. In Russian.

Electromyographic experiments are conducted on 249 human subjects (18-25 yr) with a view to study changes in the functional

state of skeletal muscles upon exposure to Coriolis accelerations. It is shown that the bioelectrical activity of skeletal muscles in man exposed to Coriolis accelerations is dependent on the individual's vestibular stability and on the exposure length. Substantial changes in the bioelectrical activity of muscles bears evidence to low vestibular-somatic stability. S.D.

A79-35122 # Nystagmographic characterization of responses to rotation of persons with different vestibular-vegetative stability (Nistagmograficheskaia kharakteristika reaktsii na vrashchenie liudei s razlichnoi vestibulo-vegetativnoi ustoichivost'iu). B. I. Poliakov, M. I. Serebrennikov, Iu. V. Lysenko, Iu. P. Ozerov, and B. V. Permiakov. *Fiziologiia Cheloveka,* vol. 5, Mar.-Apr. 1979, p. 276-280. 23 refs. In Russian.

A79-35123 # Immunophysiological aspects of man's adaptation to highland (Immunofiziologicheskie aspekty adaptatsii cheloveka k vysokogor'iu). M. M. Mirrakhimov, B. T. Tulebekov, M. I. Kitaev, K. A. Amanturova, and K. A. Saburov (Akademiia Nauk Kirgizskoi SSR, Institut Fiziologii i Eksperimental'noi Patologii Vysokogor'ia, Frunze, Kirgiz SSR). *Fiziologiia Cheloveka,* vol. 5, Mar.-Apr. 1979, p. 300-305. 31 refs. In Russian.

Immunobiological reactivity of the human organism is assessed in 47 practically normal permanent inhabitants of a lowland region (760-980 m above sea level) and in 33 permanent inhabitants of a highland region (2800 m above sea level). In addition, the lowland group is transported to a highland altitude (3200-3800 m) to be tested for adaptation and deadaptation. It is shown the initial period of adaptation, associated with the reaction to the stress situation of highland, is marked by the suppression of the T- and B-systems of immunity. Deadaptation leads to a reduction of the immunoglobulin level and of the activity of lysozyme and complement. Permanent inhabitants of highland show a reduced level of immunoglobulin M and decreased immunity to staphylococcal and streptococcal infections. S.D.

A79-35124 # Investigation of the content of hemoglobin and its fractions in permanent inhabitants of the Tien Shan and Pamir (Issledovanie kolichestva gemoglobina i ego fraktsii u postoiannykh zhitelei vysokogoriia Tian'-Shania i Pamira). Iu. A. Son (Akademiia Nauk Kirgizskoi SSR, Institut Fiziologii i Eksperimental'noi Patologii Vysokogor'ia; Kirgizskii Gosudarstvennyi Meditsinskii Institut, Frunze, Kirgiz SSR). *Fiziologiia Cheloveka,* vol. 5, Mar.-Apr. 1979, p. 306-309. 34 refs. In Russian.

Experimental observations revealed that inhabitants of Tien Shan and Pamir have hyperhemoglobinemia, associated at altitudes above 3000 m with an increase in the content of Hb A and Hb A2. Permanent inhabitants living at an altitude of 3600 m above sea level exhibit a significant increase in the content of fetal hemoglobin. S.D.

A79-35136 # Some tests used in the practice of aviation medical examination for differential diagnosis of heart diseases (Nekotorye proby, primeniaemye v praktike vrachebno-letnoi ekspertizy dlia differentsial'noi diagnostiki zabolevanii serdsta). M. D. Viadro, V. M. Kondrakov, A. K. Kochetov, and L. I. Arsen'eva. *Voenno-Meditsinskii Zhurnal,* Mar. 1979, p. 52-55. In Russian.

A large contingent of flying personnel, composed of two groups (183 subjects aged 19-35, and 65 subjects aged 36-47) underwent potassium chloride, 'obzidan' and atropine (163 subjects) tests for differential diagnosis of heart diseases. It is shown that the most diagnostically informative drug tests are the potassium chloride and 'obzidan' tests: in 71.5-82% of cases they make it possible to discriminate in young (up to 35 years of age) persons functional diseases from organic ones as well as to determine the true nature of repolarization disorders. The obzidan test is most informative in the diagnosis of ischemic heart disease, while the atropine test is suitable for assessing the cardiac conductivity and automaticity. S.D.

A79-35137 # Myocardial infarction in young men (Infarkt miokarda u molodykh muzhchin). L. M. Kliachkin, R. A. Kupchinskii, and L. E. Bochkareva. *Voenno-Meditsinskii Zhurnal,* Mar. 1979, p. 63-65. In Russian.

Results are presented for 1970-1976 clinical studies of young patients (26-40 yr) afflicted with macrofocal myocardial infarction. Attention is given to the frequency of principal risk factors, including irrational nutrition, smoking, intake of alcohol, hypertension, symptoms of premature senility, etc. Functional and other organic disorders are also considered. Electrocardiographic diagnosis of the severity of myocardial infarction and associated symptoms are discussed. Pertinent recommendations are made for preventing the occurrence of myocardial infarction at a young age. S.D.

A79-35138 # Evaluation of physiological indices during preflight medical examination of pilots (Otsenka fiziologicheskikh pokazatelei na predpoletnom meditsinskom osmotre letchikov). A. A. Kupriianov and V. V. Dudnikov. *Voenno-Meditsinskii Zhurnal,* Feb. 1979, p. 49-51. In Russian.

Results are presented for a one-year study of the circadian rhythm of basic physiological functions in 50 flying-personnel members aged 24-38. The investigation is carried out during the period of preflight medical examinations at different times of the day. The results suggest that the use of data on the normal limits of basic physiological indices will contribute to the timely detection of various deviations in the functional state of flight personnel, due to fatigue, initial symptoms of diseases, severe emotional responses, and unfavorable impact of flight factors. S.D.

A79-35363 # Nonlinear optical susceptibility of the human eye to IR radiation in the 800 to 1355 micron range (O nelineinom vospriiatii IK izlucheniia v diapazone 800-1355 nm glazom cheloveka). V. G. Dmitriev, V. N. Emel'ianov, M. A. Kashintsev, V. V. Kulikov, A. A. Solov'ev, M. F. Stel'makh, and O. B. Cherednichenko. *Kvantovaia Elektronika* (Moscow), vol. 6, Apr. 1979, p. 803-810. 12 refs. In Russian.

The present experimental study of the IR optical susceptibility of the human eye showed that in the 800 to 1355 micron range, IR radiation appears as visible radiation at a wavelength close to the second harmonic. The spectral sensitivity curve for IR radiation is spiky with the envelope maximum located at 1113 microns. The mechanism of nonlinear optical susceptibility to IR radiation appears to be localized in the retina nerves. V.P.

A79-35569 # Cell mechanisms for the biological effects of electromagnetic fields (Klitinni mekhanizmi biologichnogo vplivu elektromagnitnikh poliv). A. M. Serdiuk. *Akademiia Nauk Ukrains'koi RSR, Visnik,* vol. 43, Mar. 1979, p. 35-41. 44 refs. In Ukrainian.

The literature concerning biological effects of electromagnetic radiation is briefly reviewed. The review encompasses microwave radiation effects, the effects of magnetic fields on the central nervous system, radiation effects on ion transport, and responses of the nervous system to electromagnetic fields. An attempt is made to explain such effects in terms of cellular and molecular mechanisms. B.J.

A79-35917 # Changes in the bioelectrical activity of some cerebral structures in rabbits exposed to microwaves (Izmeneniia bioelektricheskoi aktivnosti nekotorykh struktur golovnogo mozga krolikov pod vozdeistviem mikrovoln). L. K. Ershova and M. I. Rudnev (Kievskii Institut Obshchei i Kommunal'noi Gigieny, Kiev, Ukrainian SSR). *Fiziologicheskii Zhurnal,* vol. 25, Mar.-Apr. 1979, p. 132-138. 18 refs. In Russian.

A79-35918 # Dynamics of the impulse activity of the neurons in the posterior hypothalamus upon exposure to microwaves (Dinamika impul'snoi aktivnosti neironov zadnego otdela gipotalamusa pri vozdeistvii mikrovoln). V. R. Faitel'berg-Blank and G. M. Perevalov (Odesskii Sel'skokhoziaistvennyi Institut, Odessa, Ukrainian SSR). *Fiziologicheskii Zhurnal,* vol. 25, Mar.-Apr. 1979, p. 199-202. 8 refs. In Russian.

STAR ENTRIES

N79-22135# Institute of Aviation Medicine, Farnborough (England).
HUMAN FACTORS IN SPACE VEHICLES AND SPACE STATIONS
P. Howard *In* Von Karman Inst. for Fluid Dyn. Technol. of Space Shuttle Vehicles, Vol. 2 1970 37 p

Avail: NTIS HC A22/MF A01

The human problems associated with space flight threaten to become more severe as the scale of operations expands, because the small pool of highly selected and exhaustively trained astronauts must be widened and stocked with weaker mortals. Some of the basic stresses that are inherent in all space flights are outlined. Some of the new problems are considered that may arise when the establishment of space stations changes both the nature of the mission and the characteristics of the population at risk. G.Y.

N79-22751# Missouri Univ. -Kansas City.
CITRIC ACID ENHANCEMENT OF COPPER SULFATE TOXICITY TO THE BLUE-GREEN ALGAE "APHANIZOMENON FLOS-AQUAE" AND "MICROCYSTIS AERUGINOSA" M.S. Thesis
Lise Lavaughn Ray 1978 97 p refs
(Contracts DI-14-34-0001-7053; DI-14-34-0001-7054)
(PB-291637/7; W79-03037; OWRT-A-099-MO(1)) Avail: NTIS HC A05/MF A01 CSCL 06T

Copper toxicity tests were carried out using two species of blue-green algae. Aphanizomenon flos-aquae and Microcystis aeruginosa. Copper concentrations of 300 microgram/liter or higher inhibited the growth of Aphanizomenon. The addition of 600 microgram Cu++/liter was the minimum copper concentration necessary to inhibit Mocrocystis growth over a 14-day experimental period. Copper solubility and cupric ion toxicity were enhanced by the addition of citric acid. Citric acid had no adverse effects on the algicidal properties of copper sulfate. A ratio of citric acid at eight times the weight of copper sulfate pentahydrate at a copper concentration of 500 microgram/liter (8:1 citrate-copper sulfate mixture) was inhibitory to Microcystis growth over a 14-day period, whereas the addition of 500 microgram Cu++/liter alone was not. The 8:1 mixture had the same effects as the addition of 600 microgram Cu++/liter. The increased cupric ion toxicity was not due to a pH effect. GRA

N79-22754# School of Aerospace Medicine, Brooks AFB, Tex.
ELECTRICAL PARAMETER VALUES OF SOME HUMAN TISSUES IN THE RADIOFREQUENCY RADIATION RANGE Interim Report, Oct. 1977 - Feb. 1978
John W. Penn and Earl L. Bell Dec. 1978 25 p refs
(AD-A064202; SAM-TR-78-38) Avail: NTIS HC A02/MF A01 CSCL 20/3

This report is an attempt to consolidate electrical parameter values of some human body tissues for the radiofrequency radiation range: 10 - 10,000 MHz. The sources of the data were widely distributed in scientific journals, books, and technical reports and included data points secured by experimental techniques, by computations (Debye or modified Debye equations), and by curve fitting methods. Values extracted from the conductivity and dielectric constant curves provided in the report give reasonable estimates of the interrelationships between various tissues over the frequency range of interest. These values are important in the study of effects of radiofrequency radiation on living organisms. Author (GRA)

N79-22755# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
EFFECTS OF PROPELLANT HYDRAZINES ON RED BLOOD CELLS: METHEMOGLOBIN AND HEINZ BODY FORMATION
Marilyn E. George, William E. Johnson, and Kenneth C. Back Dec. 1978 9 p refs
(AF Proj. 2312)
(AD-A064133; AMRL-TR-78-127) Avail: NTIS HC A02/MF A01 CSCL 06/16

Exposure to various hydrazine compounds causes methemoglobinemia and Heinz body production in human red blood cells. Three hydrazine compounds, monomethylhydrazine (MMH), 1,1-dimethylhydrazine (UDMH) and hydrazine (Hz) are principal components of several Air Force propulsion systems and exposure to any of these compounds produces a hemolytic anemia. The anemia following MMH exposure is characterized by methemoglobin and Heinz body formation. This study was designed to determine if UDMH and Hz exposure also produce these effects and to compare the effective dose levels. MMH is the most effective agent, producing these effects at concentrations eight to ten times lower than Hz. UDMH did not cause methemoglobinemia or Heinz bodies at the concentrations used indicating the probability of a different hemolytic mechanism. Author (GRA)

N79-22756# Duke Univ., Durham, N. C. Dept. of Ophthalmology.
ELECTROPHYSIOLOGICAL DETERMINATION OF RETINAL SENSITIVITY TO COLOR AFTER INTENSE MONOCHROMATIC LIGHT ADAPTATION Final Report, Dec. 1975 - Jan. 1977
Myron L. Wolbarsht Sep. 1978 53 p refs
(Contract F41609-76-C-0020; AF Proj. 7757)
(AD-A063852; SAM-TR-78-9) Avail: NTIS HC A04/MF A01 CSCL 20/5

The overall purpose of this research was to investigate a method for demonstrating changes in retinal ganglion-cell function after high-intensity radiation such as from a laser or other monochromatic source in the visible region. These experiments were designed to facilitate understanding functional retinal changes required to produce flash-blindness or permanent damage in human eyes, especially in the macular region which is so important in safety measures. Recordings were made from selected and well-characterized ganglion cells in animal retinas. Changes in receptive-field sensitivities were detected as a result of exposure to high-intensity monochromatic or broad-band light in part or all of the field. The time course of sensitivity recovery was also plotted. These results were then correlated with physiological and psychophysical data already known from other animal and human studies. The specific objective of this study was to delineate means by which ganglion cell responses could be used to evaluate color vision and visual-field loss after laser exposure of the monkey retina. Rabbit and cat retinas were used in developing the experimental techniques required for this evaluation. Author (GRA)

N79-22757# Center for Blood Research, Boston, Mass.
TEMPERATURE EFFECTS ON SHAPE AND FUNCTION OF

HUMAN GRANULOCYTES Annual Report, 30 Nov. 1977 - 10 Nov. 1978
Fabian J. Lionetti, Stephen M. Hunt, R. J. Mattaliano, and C. R. Valeri Nov. 1978 31 p refs
(Contract N00014-73-C-0100; Grant PHS-CA-12178-06; NR Proj. 105-707; MR0410201)
(AD-A063750; TR-6) Avail: NTIS HC A03/MF A01 CSCL 06/16

Scanning microscopic and functional studies were made of granulocytes isolated from CPD anticoagulated whole blood by counterflow centrifugation in a Beckman JE-6 rotor. The collection buffer was phosphate (20 mM) buffered saline (280 mOsM) with glucose (28 mM) and human serum albumin (1.2% w/v). The final suspension contained less than 2% mononuclear cells and 5% red cells. Incubation and fixation at various temperatures revealed two distinct temperature dependent shape transformations. At 22, 37, 40 and 45 deg C granulocytes were ameboid with extensive highly textured veils. These smoothed progressively, bullae and blebs formed, and membranes peeled finally leaving nonfunctional spheres with smooth surfaces. At 4 deg C, granulocytes were irregular spheres, less rugose but with numerous microvilli and nodules. Veiling was absent. Phagocytosis, initially low, progressively declined over 48 hours while cell surfaces became smooth. Some formed blebs, but all terminated as nonfunctional spheres with untextured surfaces containing occasional large single holes. Cellular stability estimated from changes in volume distributions, and phagocytosis by microfluorescence measurements of yeast and latex particle ingestion were also temperature dependent and paralleled the shape progressions. It is concluded that at body (30 deg C) for fever (40 deg C) temperatures, granulocytes have dynamic membranar surfaces characterized by extensive veiling and high function. At 4 deg C they are relatively inactive spheres devoid of pseudopodia or veils, yet functional at slow rates. Author (GRA)

N79-22758# School of Aerospace Medicine, Brooks AFB, Tex.
HYBRID COMPUTATION OF LEFT VENTRICULAR PERFORMANCE USING NONINVASIVE TECHNIQUES Final Report, Jan. 1976 - Jul. 1977
Edward L. Fitzpatrick, Paul J. Zalesky, Joel A. Strom, F. Wesley Baumgardner, and John W. Slaughter Dec. 1978 24 p refs (AF Proj. 7930)
(AD-A063749; SAM-TR-78-36) Avail: NTIS HC A02/MF A01 CSCL 06/16

An automated method for a beat-to-beat analysis of Systolic Time Intervals (STI) has been developed using a unilateral hybrid computer system. Beat number, time of occurrence of beat, heart rate preejection period (PEP), preejection period index (PEPI), left ventricular ejection time (LVEF), left ventricular ejection time index (ETI), total electromechanical systole (Q-S2), total electromechanical systole index (Q-S2I), isovolumic contraction time (IVCT), and ratio of PEP to LVET were calculated from simultaneous recordings of electrocardiogram, carotid pulse, and phonocardiogram. The ability of automated analysis to provide beat-to-beat values extends the usefulness of this noninvasive method to evaluate left ventricular performance. Author (GRA)

N79-22759# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
CONTRAST SENSITIVITY OF THE HUMAN VISUAL SYSTEM AT ONE LUMINANCE LEVEL WHILE ADAPTED TO A STIMULUS AT ANOTHER LUMINANCE LEVEL M.S. Thesis
Charles G. Smith Dec. 1978 145 p refs
(AD-A064370; AFIT/GE/BE/78-42) Avail: NTIS HC A07/MF A01 CSCL 05/5

This report documents an investigation of the hypothesis that the organization of the receptive fields in the human visual system changes to compensate for changes in the average luminance of the visual stimulus. Foveal measurements of contrast sensitivity to sinusoidal spatial frequency were made at one luminance level while the subjects were adapted to a spatial sinusoid of a different average luminance. The luminance levels used were 3.65 and 35.5 ft-lamberts. Contrast sensitivity curves were generated for the range of spatial frequencies from 2 through 11 cycles per degree for adapting spatial frequencies of 4, 6, and 8 cycles per degree. Adaptation and testing at the same average luminance level produced a depression in the contrast sensitivity curve centered over the adapting spatial frequency. Adapting to a low luminance level stimulus and testing at a higher luminance level produced a shift in the adaptation depression to a lower spatial frequency. Adapting to a high luminance level and testing at a lower luminance level produced a shift to a higher spatial frequency. The shift in the adaptation depression was observed for red, green, blue, and white light stimuli and was observed for the unadapted eye of a subject whose other eye was adapted. Author (GRA)

N79-22760# Gulf South Research Inst., New Orleans, La.
EVALUATION OF TOXIC EFFECTS OF ORGANIC CONTAMINANTS IN RECYCLED WATER Final Report, 30 Sep. 1976 - 31 May 1978
Nachman Gruener Dec. 1978 111 p refs
(Contract EPA-68-03-2464)
(PB-291379/6; EPA-600/1-78-068) Avail: NTIS HC A06/MF A01 CSCL 06T

The results of a comprehensive series of toxicological studies designed to evaluate the health effects of the application of recycled water for drinking purposes are reported. Exposure for a limited time (20% of a lifespan) the concentrated, recycled water (about 100-1000 times present human exposure) does not lead to physiological changes in mice. Rodent and human cells were tested in vitro for general toxicity, mutagenicity, and carcinogenicity. Results for all three effects in the tissue cultures were positive. These effects were significantly increased by the presence of a liver activation system. GRA

N79-22761*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HUMAN DISCOMFORT RESPONSE TO NOISE COMBINED WITH VERTICAL VIBRATION
Jack D. Leatherwood Apr. 1979 49 p refs
(NASA-TP-1374; L-12492) Avail: NTIS HC A03/MF A01 CSCL 05H

An experimental investigation was conducted (1) to determine the effects of combined environmental noise and vertical vibration upon human subjective discomfort response, (2) to develop a model for the prediction of passenger discomfort response to the combined environment, and (3) to develop a set of noise-vibration curves for use as criteria in ride quality design. Subjects were exposed to parametric combinations of noise and vibrations through the use of a realistic laboratory simulator. Results indicated that accurate prediction of passenger ride comfort requires knowledge of both the level and frequency content of the noise and vibration components of a ride environment as well as knowledge of the interactive effects of combined noise and vibration. A design tool in the form of an empirical model of passenger discomfort response to combined noise and vertical vibration was developed and illustrated by several computational examples. Finally, a set of noise-vibration criteria curves were generated to illustrate the fundamental design trade-off possible between passenger discomfort and the noise-vibration levels that produce the discomfort. L.S.

N79-22762# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ARPA AUTHORING SYSTEM Semiannual Technical Summary, 1 Apr. 1978 - 30 Sep. 1978
William P. Harris 30 Sep. 1978 16 p refs
(Contract F19628-78-C-0002; ARPA Order 3199)
(AD-A064723; ESD-TR-78-295) Avail: NTIS HC A02/MF A01 CSCL 05/9

A review is presented of the project to develop and field test the ARPA Authoring System for use by subject-matter experts in the preparation of task training in on-the-job environments. Materials were prepared according to the ARPA Authoring System procedures, and both preparation and delivery were on the facilities of the Lincoln Terminal System. An analysis of the lesson production rates for 30 lessons prepared by Air Force personnel revealed no systematic effects related to individual author, authoring experience, or lesson type. Preliminary results from a field test of the materials indicate that the lessons are

sound. Large savings were found in the time trainees require to reach job qualification and in the amount of labor that subject-matter experts must dedicate to training duties. Author (GRA)

N79-22763# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Mechanical and Industrial Engineering.
GRAPHIC DISPLAY OF HUMAN MOTION Technical Report, Oct. 1977 - Dec. 1978
K. D. Willmert Jan. 1979 7 p refs
(Contract N00014-76-C-0064; NR Proj. 064-548)
(AD-A064344; MIE-049) Avail: NTIS HC A02/MF A01 CSCL 05/5

Presented is the application of two and three dimensional graphic display models of a human body in studying the motion of a human being as a result of external influences. Included are an occupant during a vehicle crash and a parachutist during the opening of his chute. Author (GRA)

N79-22764# Human Engineering Labs., Aberdeen Proving Ground, Md.
AN INTERFACE EVALUATION OF THE XM-29 PROTECTIVE MASK AND THE AH-1S TELESCOPIC SIGHT UNIT Final Report
Paul F. Garrett, Jr. Oct. 1978 34 p refs
(AD-A064203; HEL-TN-12-78) Avail: NTIS HC A03/MF A01 CSCL 06/17

A field evaluation was conducted to determine the effect of the XM-29 protective mask on the mission performance of pilots in scout utility, and attack helicopter. The pilots flew air cavalry-type training missions while wearing the XM-29 and the M-24 protective mask. The evaluation was in accordance with unit training requirements, safety requirements and published standard operating procedures. The maneuvers evaluated included; hovering, out-of-ground effect hovering, nap-of-the-earth flight, aerial reconnaissance and target engagement with BTM 71A1 (inert TOW missile). Objective performance assessments were made by each pilot and his safety pilot. Subjective data was collected by using a bipolar adjective technique, debriefings and panel discussions. The data collected indicates an apparent user preference for the XM-29 protective mask. GRA

N79-22765# Wayne State Univ., Detroit, Mich. Dept. of Industrial Engineering and Operations Research.
HUMAN FACTORS ANALYSIS OF VISUAL DISTRESS SIGNALING DEVICES Final Report, 16 Aug. 1977 - 31 Oct. 1978
K. H. E. Kroemer and W. S. Marras Sep. 1978 77 p refs
(Contract DOT-CG-72225-A)
(AD-A064174; USCG-D-84-78) Avail: NTIS HC A05/MF A01 CSCL 20/6

Visual Distress Signaling Devices (VDSD) should be designed for safe and efficient use by untrained boaters under adverse operational conditions. Thus, Ergonomics/Human Factors information should be used intensively to optimize the boater - VDSD interface. Research was performed to assess compliance with Human Engineering recommendations in existing VDSD. For this purpose, a field survey was conducted first, in which the VDSD were categorized. Critical Ergonomics/Human Factors aspects were established. Secondly, laboratory tests were performed that indicated the effects of selected Human Engineering design features on identification, unpackaging, and operation of VDSD. Finally, the research results were validated in (realistically simulated) emergencies. GRA

N79-22766# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AIRCREW MODULARIZED INFLIGHT DATA ACQUISITION SYSTEM M.S. Thesis
Robert E. Hill Dec. 1978 209 p refs
(AD-A064725; AFIT/GE/EE/78-28) Avail: NTIS HC A10/MF A01 CSCL 09/2

A baseline design of a School of Aerospace Medicine sponsored aircrew physiology monitor was accomplished. The monitor design requirements were: four hour battery operation; 2x5x9 inch size for man-mounting; record four hours of 13 parameters with 1% accuracy; and use nonmechanical, nonvolatile data storage. A system design study verifies the feasibility of implementing the monitor using an 8-bit digital data system containing magnetic bubble memory. The design is partitioned into four modules. GRA

N79-23624 Rutgers - The State Univ., New Brunswick, N. J.
THE EFFECTS OF BRAIN ISCHEMIA ON THE CONTROL OF BREATHING IN UNANESTHETIZED GOATS Ph.D. Thesis
Richard William Chapman 1978 199 p
Avail: Univ. Microfilms Order No. 7910374

To investigate the effects experimentally, graded reductions of brain blood flow (BBF) were produced in unanesthetized goats. Thirty goats were prepared with chronic exteriorized (common carotidinternal maxillary) arterial shunts with obliteration of extracerebral branches. Twelve goats were prepared with chronic cerebral venous (sagittal sinus) catheters. At four levels of BBF, the following parameters were measured: ventilation, blood gas tensions, ventilatory responsiveness to CO2 by the rebreathing method with simultaneous measurement of both arterial PCO2 and cerebral venous PCO2, and ventilatory responsiveness to hypoxia was assessed by the transient inhalation of nitrogen. Dissert. Abstr.

N79-23625*# Ohio Univ., Athens. Lab. of Sensory Physiology.
A STUDY OF THE MECHANISM OF THIGMOMORPHOGENESIS IN PLANTS, WITH SPECIAL REFERENCE TO THE ROLE OF ETHYLENE AND ITS SIGNIFICANCE TO RESEARCH WITH PLANTS IN SPACE Annual Report
Mordecai J. Jaffe Apr. 1979 47 p refs
(Grant NsG-7352)
(NASA-CR-158506) Avail: NTIS HC A03/MF A01 CSCL 06C

Because of the paucity of data concerning thigmomorphogenesis, all aspects of the phenomenon were under study, although the role of ethylene mediation was central to the approach. Although this report must necessarily point to a specific time in ongoing research, several aspects of the study reached at least temporary stopping points and were therefore written and submitted for publication. These are identified. Other papers which are currently in preparation, but not yet submitted, are also identified. The phenomenon of thigmomorphogenesis is divided into the sensory function, transduction step(s) and the response function. G.Y.

N79-23626*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WILDLIFE MONITORING PROGRAM PLAN
Paul Sebesta and Roger Arno Apr. 1979 233 p refs
(NASA-TM-78578; A-7781) Avail: NTIS HC A11/MF A01 CSCL 06C

A plan for integrating the various requirements for wildlife monitoring with modern aerospace technology is presented. This plan is responsive to user needs, recognizes legal requirements, and is based on an evolutionary growth from domestic animals and larger animals to smaller, more scarce and remote species. The basis for animal study selection was made from the 1973 Santa Cruz Summer Study on Wildlife Monitoring. As techniques are developed the monitoring and management tasks will be interfaced with and eventually operated by the user agencies. Field efforts, aircraft and satellites, will be supplemented by laboratory investigations. Sixty percent of the effort will be in hardware research and development (satellite technology, microminiaturization) and the rest for gathering and interpreting data. Author

N79-23627# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND AEROSPACE MEDICINE, NO. 2, 1979
O. G. Gazenko, ed. 4 May 1979 120 p refs Transl. into ENGLISH of Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 3-75
(JPRS-73377) Copyright. Avail: NTIS HC A06/MF A01

The physiological, psychological, and biological aspects of space flight are treated. Spacecraft habitability, effects of radiation and weightlessness, and safety on long flights are covered as well as the reliability of the human component of man-spaceship system.

N79-23628# Joint Publications Research Service, Arlington, Va.

SOME PROBLEMS INVOLVED IN USING MATHEMATICAL METHODS FOR EVALUATION OF PATHOPHYSIOLOGICAL CHANGES IN THE BODY

O. G. Gazenko and V. V. Verigo *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 Mas 1979 p 1-6 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 3-7

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The major application of mathematical methods for evaluating the health state and pathogenetic mechanisms in the human body are described. The perspectives of using the method of simulation modeling in the selection of the most adequate hypotheses concerning the mechanisms of pathogenesis and in the prediction of changes in physiological processes are discussed. Basic problems in mathematical modeling of the vital physiological systems are covered. J.M.S.

N79-23629# Joint Publications Research Service, Arlington, Va.

STUDIES OF MICROBIAL FLORA AND IMMUNITY OF SALYUT-3 CREW

R. Yu. Tashpulatov and Ye. V. Guseva *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 May 1979 p 7-13 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 8-13

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The 16-day space flight aboard the orbital station Salyut-3 induced certain immunobiological changes in the cosmonauts. The space flight produced a reduction of the total count of aerobic and anacrobic microorganisms of the upper airways, skin, and the gastrointestinal tract. Postflight the biological properties of the Staphylococcus pathogenic strain remained unchanged. The reduction of the bacterial antigenic impact on the cosmonauts led to a decline of certain parameters of their natural resistance. The space flight brought about a nonspecific stimulating effect of gamma-globulins and increased significantly immunoglobulins. After completion of the mission and return to the Earth environment the content of gamma-globulins (immunoglobulins A, M, G) responsible for immune reactions returned to the normal within a relatively short period of time. Author

N79-23630# Joint Publications Research Service, Arlington, Va.

USE OF A MATHEMATICAL MODEL OF ERYTHROPOIESIS FOR EVALUATION OF EFFECTS OF SPACE FLIGHT FACTORS

V. V. Verigo and T. M. Smirnova *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 May 1979 p 14-20 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 13-18

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Mathematical model of erythropoiesis that takes into consideration the age structure of the red blood cell population is presented. The model can be used to study the mechanism of changes in the red blood volume in space flight. J.M.S.

N79-23631# Joint Publications Research Service, Arlington, Va.

BIOCHEMICAL STUDY OF PROTEINS OF GASTRIC AND INTESTINAL MUCOSA OF RATS FLOWN ABOARD THE KOSMOS-605 BIOSATELLITE

M. G. Shubich, G. M. Mogilnaya, N. M. Lutsenko, and L. L. Goryacheva *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 May 1979 p 21-28 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 19-24

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The results of the histochemical study of epithelial proteins of the gastrointestinal mucosa of rats flown for 22.5 days aboard the biosatellite Cosmos-605 and used in the synchronous and vivarium control experiments are presented. On the 2d postflight day an increased content of aromatic amino acid residues, histidine, and lysine was found in the secretion protiens of the gastric lining epithelium and the cytoplasm of the above glandulocytes, and SH groups were seen in the secretion of the lining epitheliocytes. In the small intestine the content of aromatic amino acid residues increased in the cytoplasm of border enterocytes, and that of SH-groups and free cation proteins decreased in the absorbing border. In the large intestine the cytoplasm and epitheliocyte border showed a decreased content of aromatic amino acid residues, and the border showed a drastically increased content of histidine. Twenty-seven days postflight those changes remained unchanged, increased or decreased. It is suggested that the above changes were caused by the stress effect. J.M.S.

N79-23632# Joint Publications Research Service, Arlington, Va.

EFFECTS OF VESTIBULAR FACTORS ON COLOR-DISCRIMINATING FUNCTION OF THE HUMAN EYES FOLLOWING COLOR PREADAPTATION

Zh. M. Kudryashova and A. A. Shipov *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 May 1979 p 29-37 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 25-31

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Human experiments demonstrated that upon repeated vestibular stimulation stability of chromatic vision decreases but spectral and color contrast sensitivity remains unchanged. Preadaptation to the red color reduces the rate with which adysparopy thresholds decline at subsequent vestibular exposures and delays the development of vestibula-vegetative reactions. Positive effect of preadapiation to the green color is minimal. Preadapiation to the blue color increases, upon repeated vestibular stimulation, a decline of adysparepic thresholds to different colors and facilitates motion sickness. The results should be taken into consideration in the selection of color regimens in moving systems. Author

N79-23633# Joint Publications Research Service, Arlington, Va.

THE ADRENOSYMPATHETIC SYSTEM IN THE PRESENCE OF TRAUMATIC SHOCK DURING SIMULATION OF EFFECTS OF WEIGHTLESSNESS ON THE HUMAN BODY

L. L. Stazhadze and I. V. Kovachevvich *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 May 1979 p 38-43 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 31-35

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On the basis of the study of catecholamine metabolism in simulated weightlessness experiments and in clinic, it is predicted that sympathoadrenal reactions during traumatic shock in weightlessness may have certain features. The data obtained should be taken into consideration in the development of antishock therapy. Author

N79-23634# Joint Publications Research Service, Arlington, Va.

EFFECTS OF PHYSICAL CONDITIONING AND ELECTRIC STIMULATION ON METABOLIC PROCESSES IN THE SOLEUS MUSCLE AND STRUCTURE THEREOF IN HYPOKINETIC MAN

Ye. I. Ilina-Kakuyeva, V. V. Portugalov, N. P. Krivenkova, L. I. Kakurin, M. A. Cherepakhin, G. T. Fedorenko, V. I. Pervushin, and Ye. A. Shaposhnikov *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 May 1979 p 44-49 refs

Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 35-38

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During 49 days a group of test subjects was exposed to head-down tilting, in the course of which they exercised on the bicycle ergometer and were exposed to electrostimulation before and after ergometry. Morphological and histochemical examinations of soleus biopsies showed that bed rest led to a noticeable atrophy of red and white myofibers. The structural changes were accompanied by metabolic alterations, involving a decrease of oxidative metabolism. Electrostimulation done before exercises prevented atrophy and led to hypertrophy of myofibers, which showed, however, the metabolic changes observed after bed rest per se. The combination of exercises and electrostimulation applied after them produced the least pronounced changes in the muscle tissue. The countermeasures against the bed rest induced muscle changes should be developed, taking into consideration both individual characteristics of the muscular system of the test subject and the level of its training. Author

N79-23635# Joint Publications Research Service, Arlington, Va.

DISTINCTIONS REFERABLE TO EXCRETION OF END PRODUCTS OF PROTEIN METABOLISM IN URINE OF MAN SUBMITTED TO 182-DAY ANTIORTHOSTATIC HYPOKINESIA

V. P. Bychkov, I. I. Borodulina, and A. K. Sivuk *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-7337) 4 May 1979 p 50-55 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 39-42

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Peculiar characteristics of the renal excretion of final products of protein metabolism of 18 test subjects were studied during a 182-day head-down tilting experiment. The test subjects were divided into 3 groups of 6 men in each. The 2 experimental groups differed in the level of exercises done. The third (control) group was in bed rest per se. The experimental demonstrated a benficial effect of exercises on the protein metabolims. The data obtained indicate the advisability of an advanced adaptation of test subjects to the grade of exercises, which will be recommended as a countermeasure against the adverse effects of weightlessness or its simulation, i.e. bed rest. Author

N79-23636# Joint Publications Research Service, Arlington, Va.

STEROLS BOUND WITH BLOOD PLASMA PROTEINS AND ERYTHROCYTE MEMBRANES DURING HYPOKINESIA

V. P. Vendt, L. G. Kindratyeva, N. N. Govseyeva, L. I. Apukhovskaya, S. P. Ivashkevich, V. G. Koval, and R. A. Tigranyan *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 May 1979 p 56-62 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 43-47

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In test subjects exposed to head-down tilting the quantitative and qualitative changes in sterols bound with plasma proteins and erythrocyte membranes were studied. The phasic pattern of changes of unsaponifiable substances and cholesterol was found. The changes in specific and transport proteins were opposite in most cases. Red blood cell membranes showed a change in their strength and permeability, and a gradual increase in the cholesterol content. If the cholesterol content reached maximum in red blood cell membranes (day 48) it fell down to a minimum in transport proteins. On the contrary, 14 days after completion of the experiment the content of cholesterol in membranes returned to the normal, and in transport proteins increased significantly. By thin-layer chromatography, gas-liquid chromatography, ultraviolet and infrared spectroscopy, it was shown that fast sterols, unsaponifiable esters, and sterol ketoderivatives emerged at an early stage of bed rest. Their content increased at a late stage and did not return to the norm during recovery. Author

N79-23637# Joint Publications Research Service, Arlington, Va.

INCREASED HEMOGLOBIN AND CONTENT OF RAT BLOOD SERUM AS A RESULT OF DECREASED RESISTANCE OF ERYTHROCYTE MEMBRANES TO HYPERBARIC OXYGENATION, AND THE PROTECTIVE EFFECT OF UREA

A. I. Lukash, V. V. Vnukov, and I. Ya. Sherstneva *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 May 1979 p 63-68 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 47-51

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In order to demonstrate one of the possible means of enhancing the primary toxic effect of oxygen, a complex study was pursued of erythrocyte resistance, intensity of lipid peroxidation, fractions of hemoglobin, iron and serum iron binding capacity in hyperoxic animals. The protective effect of urea, which postpones significantly the onset of a convulsive seizure was investigated. The effect of urea consists of its inhibition, in vivo and in vitro, of lipid peroxidation in the brain and lungs in the presence of hyperoxia. It is assumed that urea could analogously protect erythrocyte membranes as well. J.M.S.

N79-23638# Joint Publications Research Service, Arlington, Va.

MICROFLORA OF WATER RECLAIMED IN SEALED COMPARTMENTS

S. V. Chizhov, N. I. Omelyanets, V. V. Vlodavets, G. P. Kalina, Yu. V. Sinyak, G. I. Korchak, L. A. Vinogradova, M. I. Shikina, L. M. Smargun, and N. B. Kolesina *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 May 1979 p 69-76 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 52-57

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The data obtained allow the following recommendations to be made with respect to the water reclaimed from atmospheric condensate: intestinal microflora - Coli-titre - 333; Coli-index - 3; total microbial content as the upper permissible limit: up to 1000 microorganisms per ml of water to be used for a month, and up to 500 microorganisms per ml of water to be used for a year or more. Author

N79-23639# Joint Publications Research Service, Arlington, Va.

EXTERNAL RESPIRATION AND GAS EXCHANGE REACTIONS TO EXERCISE DURING ROTATION OF MAN ON A SHORT-RADIUS CENTRIFUGE

O. L. Golovkina *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 May 1979 p 77-83 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 58-60

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The reactions of the system of external respiration and exchange of gases to rotations on an short-radius centrifuge ($R = 2$ m) combined with exercise on a bicycle ergometer during prolonged immersion was studied. Since the system of external respiration is functionally closely related to the circulatory system, the possibility of using the parameters of external respiration to evaluate endurance for these factors was considered. J.M.S.

N79-23640# Joint Publications Research Service, Arlington, Va.

RESTORATION OF COLOR PERCEPTION AFTER DEADAPTING FLASHES

V. I. Shostak and V. V. Kolbanov *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 May 1979 p 84-87 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 61-63

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Intensive photic stimuli lead to impairment of stable adaptation of the visual analyzer and a change in virtually all visual functions that are directly related to color perception. The severity and duration of such changes are usually determined by the intensity

of the photic stimulus and brightness of adaptation background. Impairment of color perception under such conditions, particularly with regard to quantitative characteristics of restoration of color perception was studied. Results are presented. J.M.S.

N79-23641# Joint Publications Research Service, Arlington, Va.
EFFECT OF COMBINATION OF HYPOXIA AND HYPERCAPNIA ON SURVIVAL OF JAPANESE QUAIL
N. A. Agadzhanyan, V. F. Mishchenko, V. I. Fofanov, Ye. A. Shepelev, and Yu. V. Shevchenko *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 May 1979 p 88-90 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 63-65

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The survival of Japanese quail in long-term space flights was studied. The nature of changes in their vital functions with exposure to hypoxia combined with hypercapnia, which simulate a malfunction of the life-support system was determined. J.M.S.

N79-23643# Joint Publications Research Service, Arlington, Va.
EFFECTS OF DIFFERENT VALUES OF URINE pH DURING LONG-TERM STORAGE ON MICROFLORA COMPOSITION

I. V. Yakimova, N. M. Nazarov, S. V. Chizhov, and Yu. V. Sinyak *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 May 1979 p 98-101 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 68-70

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The composition of microflora in urine during long term storage was studied in terms of urine pH. Fresh urine was treated with sulfuric acid to a pH of 1.0-5.0. The pH was measured with a potentiometer. Urine was stored at room temperature in flasks with cotton stoppers for one. The Koch dish method was used to determine the total number of bacteria and fungi, as well as to isolate them in pure culture. The acid reaction of initial urine had a substantial effect on quantitative and qualitative composition of microflora, depressing bacterial growth and causing growth and development of microscopic fungi. J.M.S.

N79-23644# Joint Publications Research Service, Arlington, Va.
TISSULAR BLOOD CLOTTING FACTORS OF VASCULAR WALLS AND MYOCARDIUM DURING HYPOKINESIA
V. I. Inchina *In its* Space Biol. and Aerospace Med., No. 2 (JPRS-73377) 4 May 1979 p 102-105 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 13, no. 2, Mar. - Apr. 1979 p 70-72

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Experiments were conducted on 13 male chinchilla rabbits weighing 2-3 kg, maintained on a regimen of restricted mobility. Blood clotting and fibrinolytic properties of the aorta (layers), myocardium, and vena cava were studied by conventional methods. Tissue blood clotting factors of vessels and myocardium of 20 rabbits kept in ordinary cages were examined as a control. The results were submitted to statistical processing on a Nairi-2 computer, using the hetero group method for unrelated parameters as compared to the control group of animals, as well as intragroup method for donar plasma used as a substrate. Results are discussed. J.M.S.

N79-23646 California Inst. of Tech., Pasadena.
A MOLECULAR DESCRIPTION OF OXYGEN BINDING TO HEMOGLOBIN Ph.D. Thesis
Barry Duane Olafson 1979 196 p
Avail: Univ. Microfilms Order No. 7909834
The bonding of O2 to hemoglobin (Hb) at the molecular level is discussed. The ideas presented are the results of ab initio calculations on idealized portions of the Hb molecule. The bond between Fe and O2 is formed by coupling a triplet state of Fe to the triplet ground state of O2. The heme plane and axial imidazole ligand were seen to play a key role in promoting reversible O2 binding. The effective how movement of the proximal imidazole, long thought to initiate the change in quaternary structure of Hb, is also responsible for the reduced O2 affinity in the T quaternary form of Hb is shown. The ozone model of transition metal-O2 binding leads to the prediction of a second metal-O2 stretching band between 1000-1200/cm. It was also used to tentatively assign the near-infrared and z-polarized ultraviolet-visible spectra of HbO2, HbCN, and HbCO.
Dissert. Abstr.

N79-23647 Carnegie-Mellon Univ., Pittsburgh, Pa.
APPLICATION OF PATTERN RECOGNITION TO ULTRASONIC TISSUE CHARACTERIZATION Ph.D. Thesis
Mark George Czerwinski 1979 155 p
Avail: Univ. Microfilms Order No. 7909874
An investigation of ultrasonic tissue characterization concentrating on applying the methods of pattern recognition to determine the set of dynamic properties of the ultrasonic A-scan which could be used to distinguish the normal and diseased kidney tissue was conducted. A data base consisting of A-scans obtained from normal and diseased exposed rabbit kidneys in vivo was assembled. Experimental hematogenous E. coli pyelonephritis was induced in one kidney of each rabbit while allowing the other kidney to remain normal. The A-scans were recorded from each kidney in blocks of 32, with 0.256 sec. interval between the A-scans, using short pulses from a 3.5 MHz transducer. A total of 832 A-scans (26 blocks) were recorded from 7 normal kidneys, and 896 A-scans (28 blocks) from 7 pyelonephritic kidneys.
Dissert. Abstr.

N79-23648 Brigham Young Univ., Provo, Utah.
CARDIAC ADAPTATION TO ENDURANCE TRAINING: DETERMINED BY ECHOCARDIOGRAPHY AND ELECTROCARDIOGRAPHY Ph.D. Thesis
Ted Dunn Adams 1978 150 p
Avail: Univ. Microfilms Order No. 7911884
Using echocardiography and electrocardiography cardiac and fitness performance before and after a three month endurance training program (ETP) were investigated. Thirty untrained male subjects (mean age = 23) were used (22 experimental and 8 control). The supervised ETP consisted of 50 minute jogging sessions five days a week at 85 percent maximum heart rate.
Dissert. Abstr.

N79-23649 Louisiana State Univ. and A&M Coll., Baton Rouge.
THE INFLUENCE OF VARIOUS PHYSIOLOGICAL RESPONSES ON RATINGS OF PERCEIVED EXERTION BEFORE AND AFTER TRAINING Ph.D. Thesis
David Richard Carter 1978 126 p
Avail: Univ. Microfilms Order No. 7911561

Subjects were administered a Physical Work Capacity test in order to establish a work load criterion for the 6 min. RPE test protocol utilizing a 60 rpm cadence on the bicycle ergometer. Heart rate, oxygen consumption, and carbon dioxide production data were recorded at each 30 sec. interval in the 6 min. exercise bout. Respiratory quotient and oxygen pulse were computed from the metabolic data. Two minutes after completion of the 6 min. work bout, a 6 cc blood sample was drawn from the anticubital vein for the determination of blood lactate, sodium, and potassium concentration. After completion of the pre test an individualized bicycle training program was designed. Split plot analysis of variance, factorial analysis of variance, and stepwise multiple regressions were utilized to determine differences occurring as a result of training and the importance of the physiological variables in predicting the RPE. Dissert. Abstr.

N79-23650 Mississippi Univ., Jackson.
THE PULMONARY CIRCULATION: STUDIES ON ALVEOLAR HYPOXIA AND VASCULAR SMOOTH MUSCLE METABOLISM Ph.D. Thesis
Richard Earnest Parker 1978 115 p
Avail: Univ. Microfilms Order No. 7909379

Established gravimetric techniques were employed to study the effects of alveolar hypoxia on pulmonary vascular resistance, pulmonary capillary pressure, and pulmonary capillary filtration coefficient in isolated, perfused, and ventilated whole canine lungs. Alveolar hypoxia significantly increased the total pulmonary vascular resistance by approximately 110 percent. As a result of the dramatic increase in precapillary to postcapillary resistance ratio, the pulmonary capillary pressure decreased significantly during alveolar hypoxia. The pulmonary capillary filtration coefficient increased significantly by approximately 100 percent during alveolar hypoxia. The metabolic requirements of arterial vascular smooth muscles of the lung were analyzed using standard histochemical procedures. Dissert. Abstr.

N79-23651 Indiana Univ., Bloomington.
THE EFFECTS OF ACTIVE AND PASSIVE HEAT ACCLIMATIZATION PROCEDURES ON THE CARDIOVASCULAR, THERMOREGULATORY, AND SWEAT RATE RESPONSES TO WORK IN THE HEAT IN MALE HUMANS Ph.D. Thesis
Farouk Elsayed Abdelwahab 1978 782 p
Avail: Univ. Microfilms Order No. 7909675

The physiological changes that occur in two different methods of acclimation to heat were investigated. The two methods were that of active acclimatization (physical exercise on a motor driven treadmill) and passive acclimatization (subjects immerged in water bath, nonexercise). It is concluded that passive heat acclimation procedures can enhance the cardiovascular and thermoregulatory responses to work in the heat, but that the classical exercise acclimation procedures confer a greater adaptation.
Dissert. Abstr.

N79-23652 Kansas Univ., Lawrence.
A STUDY OF THE EFFECTS OF SIX LIGHT CONDITIONS ON CALORIC INDUCED NYSTAGMUS Ph.D. Thesis
Elizabeth Ann Karlsen 1978 81 p
Avail: Univ. Microfilms Order No. 7910719

The conditions included: eyes open with lighted Frenzel lenses, eyes open with lighted Frenzel lenses + strobe lighting, eyes open in darkness, eyes closed in darkness, eyes closed in a dimly lighted room, and eyes open with unlighted Frenzel lenses + strobe lighting. Twenty normal hearing volunteers were randomly assigned to have their right or left ear irrigated with 250 cc of 30 degrees centigrade water under each of the six conditions. The order of conditions was randomized for each subject independently. Five response parameters were measured: speed of the slow component, latency, duration, amplitude and frequency. Since some of the data were not normally distributed the non-parametric Freidman Analyses was used. This analysis was signidicant for all five parameters. Multiple comparisons were then conducted with the Wilcoxson's Signed Rank Test. Signifcant differences were found on all parameters. Dissert. Abstr.

N79-23653*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
BIOMEDICAL APPLICATION IN SPACE, PILOT PROGRAM IN THE SOUTHERN CALIFORNIA REGION Final Report
A. A. Kelton Jan. 1979 58 p refs
(Contract NAS9-15493)
(NASA-CR-160171; MDC-G7789) Avail: NTIS HC A04/MF A01 CSCL 06B

A pilot program is presented which was to promote utilization of the Shuttle/Spacelab for medical and biological research applied to terrestrial needs. The program was limited to the Southern California region and consisted of the following five tasks: (1) preparation of educational materials; (2) identification of principal investigatigators; (3) initial contact and visit; (4)development of promising applications; and (5) evaluation of regional program methodology. G.Y.

N79-23654*# Technology, Inc., Houston, Tex. Life Sciences Div.
ANALYSIS OF BODY FORM USING BIOSTEREOMETRICS Final Report
1979 142 p refs
(Contract NAS9-15220)
(NASA-CR-160173) Avail: NTIS HC A07/MF A01 CSCL 06P

The general objective of the research was to provide the space and life sciences directorate with an improved biostereometric measurement capability. This objective was determined from the usefulness of stereophotogrametric techniques developed during the Apollo and Skylab Missions to measure body conformation, surface area, volume and relative density of astronauts. These noninvasive anthropometric measurements provided invaluable data concerning the physiological, biochemical and nutritional effects of the space environment upon the human body. The indirect nature of the technique has many advantages over other methods, and has a potential for many other applications. The stereophotographs contain an enormous amount of data which can be later reexamined should the need arise.
G.Y.

N79-23655# Flying Personnel Research Committee, London (England).
THE INFLUENCE OF SEAT BACK ANGLE ON ACCELERATION TOLERANCE
D. H. Glaister Mar. 1978 20 p refs
(FPRC/1365) Avail: NTIS HC A02/MF A01

From a review of published data, the influence of seat back angle on G-tolerance was found to be well described by an equation of the form - tolerance = a + b/cos alpha, where alpha is the angle between seat back and G-vector. This relationship was found to hold good for relaxed unprotected subjects as well as for those wearing anti-G suits, or fully protected by anti-G suit, breathing maneuvres and muscle tensing. Best-fit regressions predicted that, in order to increase greyout tolerance by 1.0G from that obtained in a conventional upright seat, a back angle of 58 degrees would be required, whilst increments of 2.0G and 3.0G would require angles of 69 degrees and 74 degrees respectively. An anti-G suit was found to give an increase in greyout tolerance of 1.21G and full protection, 3.15G, independent of back angle. When G-tolerance was assessed in terms of psychometer performance, a similar relationship to back angle was found. Author

N79-23656# Flying Personnel Research Committee, London (England).
THE EFFECT OF ACCELERATION AND SEAT BACK ANGLE ON PERFORMANCE OF A REACTION TIME TASK
B. J. Lisher and D. H. Glaister Mar. 1978 18 p refs
(FPRC/1364) Avail: NTIS HC A02/MF A01

The performance of a complex choice reaction time task was studied with reference to various acceleration levels and three seat angles. The maximum acceleration levels reached were determined by the subjects themselves. The seat back angles were 17, 52, and 67 degrees from the vertical. Author

N79-23657*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
URINE COLLECTION APPARATUS Patent Application
Roger B. Michaud, inventor (to NASA) (Martin Marietta Corp., Denver, Colo.) Filed 27 Apr. 1979 21 p Sponsored by NASA
(NASA-Case-MSC-18381; US-Patent-Appl-SN-034531) Avail: NTIS HC A02/MF A01 CSCL 06P

A urine collection device for females comprising an interface body with a surface for engagement with the user's body is described. The interface body is composed of a forward portion defining a urine-receiving bore with an inlet in the interface surface adapted to the urethal opening of the user, and a rear portion integrally adjoining the forward portion with a noninvasive vaginal seal on the interface surface. A removable absorbent pad is supported on the interface body and is extended laterally. A garment is provided for supporting the urine collection device. NASA

N79-23658# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering-Science and Mechanics.
STUDIES OF LIMB-DISLODGING FORCES ACTING ON AN EJECTION SEAT OCCUPANT Final Report, 1 Mar. 1977 - 28 Feb. 1978
Daniel J. Schneck Wright Patterson AFB., Ohio AMRL Jan. 1979 41 p refs
(Grant AF-AFOSR-3296-77; AF Proj. 2312)
(AD-A064882; VPI-E-78-16; AMRL-TR-78-1) Avail: NTIS HC A03/MF A01 CSCL 06/7

In this report, the forces tending to dislodge the limbs of an ejection seat occupant from one another, or from a restraining surface, are calculated in the absence of flow separation. For a simulated ejection taking place at an altitude of 10,000 feet, the results show that, based on published data for a pilot's average grip retention capability, the probability of his letting go is 100% if the ejection occurs at Mach numbers exceeding 0.72. Moreover, the probability of major flail injury is around 100% if the ejection Mach number exceeds around 1.25. One major factor which contributes to these large limb-dislodging forces is the generation of stagnation points in the flow. In order to examine further the role played by flow separation around the blunt body segments, a complex velocity potential is developed to describe a stationary vortex pair located in the wake region of the flow. It remains to super-impose this vortex pair on the unseparated cross flow in order to ascertain the drag forces which contribute to limb-dislodgement. Author (GRA)

N79-23659# Harvard Medical School, Boston, Mass.
CARDIO-PULMONARY RESPONSE TO SHOCK Annual Progress Report, 1 Feb. - 31 Aug. 1978
Herbert B. Hechtman Aug. 1978 18 p refs
(Contract DAMD17-78-C-8026)
(AD-A065672) Avail: NTIS HC A02/MF A01 CSCL 06/16

Pressure breathing and particularly PEEP were found to alter pulmonary metabolic activities. In animals treated with PEEP: there was release of a humoral agent which decreased contractility; plasminogen activator normally cleared by the lungs during spontaneous breathing was now secreted; there was a decreased ability to clear barbiturates and lactate; a selective red cell acidosis was induced (during lactate infusion); and systemic blood flow was redistributed. Metabolism was severely altered when a lung lobe was isolated and perfused from a support dog. A variety of negative inotropic agents were released which led to death of the support animal. These cardiac muscle studies were assisted by the development of a new, isolated papillary muscle chamber. Author (GRA)

N79-23660# Pittsburgh Univ., Pa. Display Lab.
EFFECT OF OPTICAL MAGNIFICATION ON THE PERCEPTION OF DISPLAYED ORIENTATION Technical Report, Sep. 1977 - Aug. 1978
Richard R. Rosinski 1 Mar. 1979 29 p refs
(Contract N00014-77-C-0679)
(AD-A065949) Avail: NTIS HC A03/MF A01 CSCL 05/8

Two experiments are reported that assess distortions of perceived surface orientation as a result of geometric distortions of two-dimensional spatial displays. Optical magnification (defined in terms of the ratio of actual to geometrically correct viewing distance) greatly affected perception of surface orientation when no consistent information was available for the magnitude of spatial distortion. However, when magnification was caused by (and perfectly correlated with) viewing distance, observers were able to totally compensate for or discount the effects of the geometric distortion of space. Compensation for spatial distortion is dependent on the means by which such distortions are produced. Implications of these results and the compensation process are discussed. Author (GRA)

N79-23661# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
SURVIVAL AND PROTECTION OF AIRCREW IN THE EVENT OF ACCIDENTAL IMMERSION IN COLD WATER
C. Boutelier (Aerospace Med. Lab., Bretigny-sur-Orge, France) Feb. 1979 125 p refs
(AGARD-AG-211(Eng); ISBN-92-835-1301-0) Avail: NTIS HC A06/MF A01

The survival of aircrews in the case of accidental cold water immersion is limited by the extent of thermal losses. In this AGARDograph, the physical laws governing thermal exchanges in both air and water are described. The state-of-the-art in the fields of physiological reactions, tolerance, acclimatization, cold induced accidents and their treatment is reviewed. Finally, the major items of protective equipment used in aeronautics and the methods applied to test their effectiveness are described. L.S.

N79-23662*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DISCOMFORT CRITERIA FOR SINGLE-AXIS VIBRATIONS
Thomas K. Dempsey, Jack D. Leatherwood, and Sherman A. Clevenson May 1979 60 p refs
(NASA-TP-1422; L-12681) Avail: NTIS HC A04/MF A01 CSCL 05H

Experimental investigations were conducted to determine the fundamental relationships governing human subjective discomfort response to single-axis vibrations. The axes investigated were vertical, lateral, longitudinal, roll, and pitch, and the vibrations used were both sinusoidal and random in nature. Results of these investigations provided the basis for: (1) development of a scale of passenger discomfort that is common to all axes of vibration; and (2) generation of discomfort criteria for each axis of each axis and for both types of vibration. Furthermore, empirical equations describing discomfort responses within each axis of vibration are included. G.Y.

N79-23663# RAND Corp., Santa Monica, Calif.
INDIVIDUAL DIFFERENCES IN KNOWLEDGE ACQUISITION FROM MAPS Technical Report, Nov. 1977 - May 1978
Perry W. Thorndyke and Cathleen Stasz Jan. 1979 61 p refs
(Contract N00014-78-C-0042)
(AD-A065040; RAND/R-2375-ONR) Avail: NTIS HC A04/MF A01 CSCL 05/10

This study investigated the strategies people use to acquire knowledge from maps. Three expert and five novice map users studied a map and provided verbal protocols of their study behavior. Analysis of the learning protocols suggested four categories of processes that were invoked during learning: attention, encoding, evaluation, and control. Large individual differences in both performance and strategy usage were observed in this task. Analyses of the performance and strategy data revealed that the use of certain strategies in each category, particularly those used for encoding spatial information, was most predictive of learning performance. In addition, good learners differed from poor learners in their ability to evaluate their learning progress and to focus their attention on learned information. An analysis of the performance of map-using experts suggested that success in learning depended on strategies and not on familiarity with the task domain or materials. The implications of these results for training expertise in map learning are discussed. Author (GRA)

N79-23664# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
APPLICATION OF LEARNING CURVES OF AIRCRAFT PRODUCED AT MORE THAN ONE LOCATION TO THE F-16 LIGHTWEIGHT FIGHTER M.S. Thesis
Anthony Mlinar Sep. 1978 90 p refs
(AD-A065881; AFIT/GSM/SM/78S-16) Avail: NTIS HC A05/MF A01 CSCL 05/9

This thesis analyzed the effect of coproduction of the F-16 fighter on the learning curve of the F-16 aircraft purchased by the United States. This analysis was performed by studying the effect of coproduction of previously coproduced aircraft. The aircraft that were analyzed are the B24, B29, B47E, B52F, F84F, F86F, and F100C. The F-16 is being produced in the United States and Europe. However, since the aircraft purchased by the USAF will be a combination of parts from both the United States and Europe, the learning curve of the USAF purchased

aircraft will be a combination of two production lines. The combination of two production lines result in increased average cost per unit when compared to the average cost per unit of aircraft produced on only one line. Also, the analysis of previously coproduced aircraft showed that the coproducer's learning curve had a higher first unit cost and steeper slope than would be expected if all learning was initially transferred and utilized by the coproducer. These results imply that the European Consortium production learning curve will have a higher first unit cost, steeper slope, and average cost per unit than the United States production learning curve. Therefore, the USAF purchased F-16 learning curve will have a higher first unit cost, steeper slope, and higher average cost per unit than a single production line in the United States. Author (GRA)

N79-23665 British Library Lending Div., Boston Spa (England).
PHYSICAL AND MENTAL WORKING ENVIRONMENT IN A TERMINAL BASED COMPUTER SYSTEM
Ewa Gunnarsson and Olov Ostberg Feb. 1979 54 p refs Transl. into ENGLISH of "Undersokwingsrapport Arbetarskydds-styrelsen Arbetsmedicinska Avdelningen", Investigation Report-35 Natl. Board of Occupational Safety and Health, Stockolm, 1977 54 p
(BLL-RTS-11634; Rept-35) Avail: British Library Lending Div., Boston Spa, Engl.

In several connections various complaints are made by terminal operators. The complaints concern on the one hand changes in work routines and work content by computerization, in general, on the other hand the complaints concern more specific physical discomforts. In order to investigate the physical and mental work-environment problems of the operators, a study was done at an office with a terminal based computer system. In particular, terminal-intensive work routines were examined in order to find out whether or not there was any need for limitation of working hours and special working glasses. The investigation consisted mainly of extensive interviews and a photographic activity study. G.Y.

N79-23666*# Hamilton Standard, Hartford, Conn.
CONCEPT DEFINITION FOR AN EXTENDED DURATION ORBITER ECLSS
H. Brose Sep. 1977 244 p
(Contract NAS9-14782)
(NASA-CR-160164) Avail: NTIS HC A11/MF A01 CSCL 06K

Extending the seven-day Shuttle Orbiter baseline mission requires an evaluation of the Environmental Control and Life Support (ECLS) System in order to determine those changes necessary or desirable so that the Orbiter payload capability will not be seriously compromised. The ECLSS requirements and subsystem options for extended duration Orbiter missions are defined. Each major ECLS subsystem was examined, and potential methods of extending the mission capability were studied. The mission evaluated most extensively for this effort was a 30 day mission with a crew size of seven men. However, missions up to 90 days duration with crew sizes of three to ten men were also examined. G.Y.

N79-23667# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
A HUMAN ENGINEERING SPECIFICATION FOR LEGIBILITY OF ALPHANUMERIC SYMBOLOGY ON VIDEO MONITOR DISPLAYS
E. L. Gorrell Jan. 1979 24 p refs
(AD-A064960; DCIEM-TR-79X01) Avail: NTIS HC A02/MF A01 CSCL 05/5

Conventional human engineering specifications for display of alphanumeric symbology on video monitors consist of predictors of user performance derived from studies of display legibility. These predictors include CRT and matrix display symbol generation variables, CRT raster structure and phosphor variables, together with other variables such as symbol format and display surface anti-glare treatment. This report discusses a number of significant problems associated with the development and application of conventional human engineering display specifications and presents a detailed specification for comparative and objective evaluation of video monitor legibility performance based upon legibility tests developed for the USAF. This specification consists of criteria for subject selection, visual environment design, display monitor setup, test material design and presentation, legibility task scores, and legibility test performance. Author (GRA)

N79-23668# Anthropology Research Project, Yellow Springs, Ohio.
GUIDELINES FOR FIT TESTING AND EVALUATION OF USAF PERSONAL-PROTECTIVE CLOTHING AND EQUIPMENT
John T. McConville, Ilse Tebbets, and Milton Alexander Jan. 1979 45 p refs
(Contract F33615-78-C-0508)
(AD-A065901; AMRL-TR-79-2) Avail: NTIS HC A03/MF A01 CSCL 06/17

Detailed procedures for the conduct of anthropometric fit tests are outlined in this document which is designed primarily for the use of engineering anthropologists and other technical personnel called upon to carry out fit tests and evaluations of personal-protective clothing and equipment. Suggestions are provided for the design of questionnaires, the selection of a representative test sample and the choice of dimensions to be measured. The authors outline step-by-step procedures for conducting the fit test itself and discuss various features of the test item which will require evaluation. These include protective capacity, fit, function, comfort and integration with other parts of an assemblage. Recommendations for reporting significant results and suggested guidelines for approval or rejection of the test item are given in the concluding chapter. An appendix includes sample forms and supporting materials which are recommended for use by the investigator. Author (GRA)

N79-23669# National Physical Lab., Teddington (England). Div. of Numerical Analysis and Computer Science.
MM/1, A MAN - MACHINE INTERFACE: A CONTRIBUTION TOWARDS A STANDARD
D. Schofield, A. L. Hillman, and J. L. Rodgers Oct. 1978 25 p refs
(NPL-CSU-2/78) Avail: NTIS HC A02/MF A01

In software interface between a computer system and its user, consistency of interaction is essential though it is argued that it is too early to define true standards. A family of user interfaces, MM/1, which can be used as a basis for interactive dialogue and input, is described. The thinking behind the interface is given, together with experience of its use in three different systems. Author (ESA)

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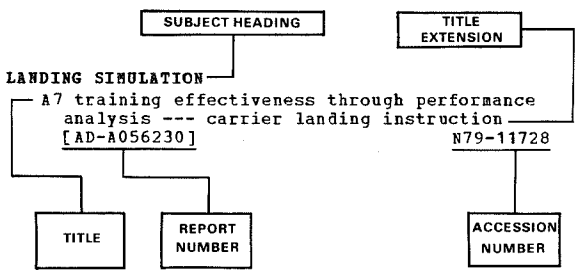

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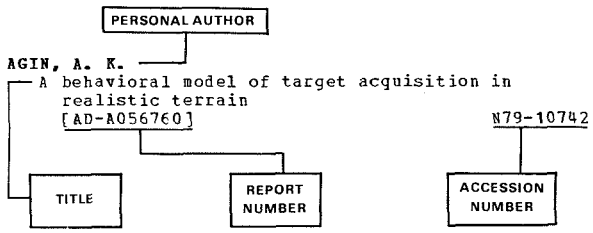

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1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA SP-7011 (196)		

4. Title and Subtitle	5. Report Date
AEROSPACE MEDICINE AND BIOLOGY A Continuing Bibliography (Supplement 196)	August 1979
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
	10. Work Unit No.
9. Performing Organization Name and Address National Aeronautics and Space Administration Washington, D. C. 20546	11. Contract or Grant No.
	13. Type of Report and Period Covered
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15. Supplementary Notes

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17. Key Words (Suggested by Author(s))	18. Distribution Statement
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